State of Alaska
Alaska Energy Authority, Rural Energy Group

CONCEPTUAL DESIGN REPORT

KWETHLUK
RURAL POWER SYSTEM UPGRADE

August 10, 2007

Prepared by:

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EXECUTIVE SUMMARY

This report has been prepared for the Alaska Energy Authority, Rural Energy Group. Its purpose is to provide the basis for a new power plant with an associated schedule and cost estimate for the community of Kwethluk, Alaska.

The report includes a review of the existing power plant and power distribution system, an analysis of future needs, a conceptual design to meet these needs, a proposed project schedule, and a budget level cost estimate for the project.

The village corporation, Kwethluk Incorporated, will be the only participant in the proposed power plant.

The existing power plant has two 270 kW generators and a 350 kW generator. The generators cannot be run in parallel with each other. At the time this report was prepared, the 270 kW generators were not in service. The generators are located in a metal-sided, wood-framed building, supported by a wood foundation. The existing plant does not have a heat recovery system. The community has had to ration power in recent years. Since the plant cannot meet the community's power generation needs, plans for piped water and sewer systems, and a lack of capacity for future expansion, the existing power plant should be replaced.

The site selection process involved reviewing pertinent public documents and aerial photographs, consulting with community leaders, and conversations with government agencies. The result of these efforts was the selection of a site for the proposed power plant that is adjacent to recently constructed fuel oil tank farm. The proposed power plant will be located within Section 5, Township 8 North, Range 69 West, Seward Meridian, Alaska.

The proposed building is metal structure, measuring 36 feet by 48 feet. A 5,000 gallon intermediate tank would also be installed at the site to provide the proposed plant with fuel storage. The power plant and tank would be supported either on grade using concrete sleepers on a gravel pad, or using a driven pile foundation with a smaller gravel pad as an access area. The intermediate tank would be connected to a fuel pipeline running from the existing tank farm.

A power generation capacity of 1,100 kW is recommended for the proposed power plant. The generators and their sizing will allow the plant to meet the power needs of the entire community for the next ten years. The plant will be designed to allow the plant's electrical generation capacity to be increased if the community's growth exceeds the estimated growth rate used to size the plant.

Construction is scheduled to conclude in the fall of 2009 if a gravel pad foundation is used, while construction would conclude in fall of 2008 using a pile foundation. The proposed schedules are very dependent upon many inter-related factors, such as project start time, material availability and weather. If any of these items creates a delay, the project may run into the following season,

which will increase the construction costs. In order to address this potential delay and increased cost, a 10% construction contingency should be used in cost estimating for the project.

The total budget level cost estimate for the proposed power plant is $3,510,063.00, if a gravel pad foundation is constructed, and $3,453,800.00 if a pile foundation is installed. These estimates include the costs for: upgrades to the existing electrical distribution system, design, construction administration, permitting, legal and insurance costs, construction costs (based on competitive bid), and a 10% construction contingency.

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APPENDICES

I. INTRODUCTION

The Alaska Energy Authority (AEA), Rural Energy Group is pursuing grant funds to upgrade rural power systems. The following terms and conditions of the program will affect your village:

- Most of the funds are federal and provided through the Denali Commission. Other federal funding may be available from HUD (ICDBG) and the Environmental Protection Agency (EPA). Additional funds may be available from the State of Alaska, through the Department of Environmental Conservation and the Department of Education.

- In order to receive grant funds, each village must first produce an acceptable community plan for development. The Denali Commission defines a community's community plan as a road map for how the community wants to develop. A community plan should include current and historical information regarding the community as well as a plan for the future. A community plan is an umbrella document that is made complete by various infrastructure and program specific plans. Other plans that a community develops should fit into a larger comprehensive document – or – incorporate the items listed below into the current plan. For example, an Indian Housing Plan or CEDS Plan may be considered an acceptable plan if it speaks to the nine points listed below.

    1. Community vision (developed by community)
    2. Community goals and objectives (developed by community)
    3. Community involvement and process
    4. Background for planning
    5. Economy and Population summary
    6. Land use summary
    7. Community facilities and utilities summary
    8. Transportation summary
    9. and a plan for implementation

    Agency Coordination: In an effort to coordinate and begin using the same information for community documents, the Denali Commission suggests that communities first check with state and federal agencies to review information that has been collected on their community, and to get the data from those agencies rather than pay someone else to gather it for them.

    Possible Resources: The Denali Commission does not want to create additional hardship on communities as they strive to meet this planning requirement. They encourage communities to use existing plans and simply add information that may be absent for that particular planning standard. Agencies can be a tremendous resource as can some regional organizations including housing authorities, health corporations, non-profits, boroughs, CDQs, ARDORs, and School Districts. Successful plans are locally developed and regionally supported.

- In order to receive grant funds, each village must demonstrate that the proposed facility will be sustainable with a Business Plan under Denali Commission policies. The business plan must describe who will own the facility, and how it will be operated and maintained. The plan will need to describe how the village will collect funds to pay for operations, maintenance, insurance, major repairs, and long term replacement. A business plan will be prepared as part of this project.

- New power plants are funded, designed, and constructed in three phases: Phase 1 – Conceptual Design; Phase 2 – Design Completion; and Phase 3 – Construction.

- During Phase 1 – Conceptual Design, staff from AEA will visit a village, discuss the program, and work with residents and the local government to select a site for the new power plant. The local government will be requested to decide if it wants this program, and to indicate that AEA should proceed with conceptual design by passing a formal resolution.

- At the completion of Phase 1 – Conceptual Design, the village will be requested to review and formally approve the location and capacity of the power plant, by resolution.

- During Phase 2 – Design Completion, the design for the new power plant will be completed.

- Each village will be requested to provide "in kind" contributions by providing land for the new power plant and free use of local heavy equipment. The grant funds pay for fuel, maintenance, and repairs during construction.

- Project may include local hire and construction trade training programs, subject to Denali Commission funding.

- **Exclusions:**
  - Project does not include purchase of lands.
  - Project does not include remediation of contaminated soils.
  - Project does not include decommissioning of existing fuel tanks or pipelines.

This report has been prepared for the Alaska Energy Authority, Rural Energy Group, to identify the design basis for the development of a new power plant in the community of Kwethluk, Alaska.

Included in the report is a review of the existing power generation facility and electrical distribution system, an analysis of future power needs, a conceptual design for a new power plant, a proposed project schedule, and a budget level cost estimate for the project.

An engineering investigation was made which included a review of overhead aerial photography and design documents, and a site visit. The investigation also included conversations with community leaders, governmental agencies, and their representatives. Research was also provided by various consultants.

Kwethluk Incorporated, the village corporation, will be the only participant in this project, as they will be the Owner of the land and the operating electric utility, Kuiggluum Kallugvia.

On February 13, 2007, Chariton Epchook, George Guy, Phillip Guy, Martha E. Jackson, and James Nicori with Kwethluk Incorporated, Daniel Reynolds with LCMF LLC, and Ron Brown with AEA met in Kwethluk to discuss the project. An electrical distribution system inspection was conducted from February 16 to February 18, 2007 by Greg Errico with Errico Electrical Engineering.

Subsequent data gathering was performed by Daniel Reynolds of LCMF LLC. Subconsultants used for this project were Rick Elliott for site control research, Duane Miller Associates for geotechnical consultation, and Greg Errico with Errico Electrical Engineering for the distribution system inspection and evaluation.

A. CONTACTS

1. Project Team

Alaska Energy Authority:	813 West Northern Lights Blvd, Anchorage, AK 99503	
Kris Noonan	Manager, Rural Power Systems	(907) 269-4697
Ron Brown	Project Manager	(907) 269-4698
Martina Dabo	Alternative Energies	(907) 269-3027
Terry Harper	Power Cost Equalization (PCE)	(907) 269-4630
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LCMF, LLC:	615 East 82nd Ave, Suite 200, Anchorage, AK 99518	
Wiley Wilhelm	Engineering Manager	(907) 273-1851
Joe Daniels	Project Manager	(907) 273-1811
Daniel Reynolds	Project Engineer	(907) 273-1810
Fax		(907) 273-1831

2. Participants

Kwethluk Incorporated:		
James Nicori	President	(907) 757-6613
George Guy	Business Manager	(907) 757-6613
Fax		(907) 757-6212

3. Subconsultants

Rick Elliott, Land Consultant:		1407 Kinnikinnick St., Anchorage, AK 99508
Rick Elliott		(907) 868-4043
Fax		(907) 868-4043
Duane Miller & Associates:		5821 Arctic Blvd, Anchorage, AK 99518
Duane Miller	Principal Engineer	907) 644-0510
Fax		(907) 644-0507
Errico Electrical Engineering:		P.O. Box 220471, Anchorage, AK 99522
Greg Errico	Principal Engineer	(907) 345-6168
Fax		(907) 345-6168

4. Additional Contacts

Additional information for this report was provided by the following people:

Phillip Guy	Kwethluk Incorporated	(907) 757-6613
Roger Larson	Lower Kuskokwim School District	(907) 543-4890
Elizabeth Johnson	Department of Labor	(907) 465-6028
Jeff Stanley	CRW Engineering Group, LLC	(907) 562-3252
Michael Stoianoff	Department of Transportation	(907) 269-0653

B. APPLICABLE REGULATIONS, CODES AND POLICIES

1. State and Federal Regulations

The design and operation of a new power plant and the associated fuel systems are controlled by the following state and federal regulations:

- State of Alaska Fire and Life Safety Regulations (13 AAC 50)
- 2003 International Fire Code as adopted by 13 AAC 50
- 2003 International Building Code as adopted by 13 AAC 50
- EPA Oil Pollution Prevention Regulations (40 CFR Part 112)
- State of Alaska Oil and Hazardous Substances Pollution Control Regulations (18 AAC 75)
- ADEC Air Quality Regulations (18 AAC 52)
- Regulatory Commission of Alaska (RCA) Certification (3 AAC 42.05.221)

The current State of Alaska Fire and Life Safety Regulations adopted the 2003 editions of the International Fire Code (IFC) and the International Building Code (IBC). The code requirements of the IFC establish the primary design requirements for new facilities.

The State of Alaska Air Quality Regulations applies to emission generating equipment. The facility will require certification from RCA prior to initial use.

The U.S. Environmental Protection Agency (EPA) Spill Prevention Control and Countermeasures Plan (SPCC) identifies minimum fuel facility requirements for aboveground tanks larger than 1,320 gallons.

2. Alaska Energy Authority Policies

a. Site control must be obtained before a grant agreement is finalized and prior to construction. The grantee is responsible for obtaining site control of the main facility site and associated pipelines. AEA's goal is to have site control complete for the power plant facility by mid-December, the year prior to the construction season in which construction of the facility will begin.

b. Land for constructing the power plant facility on should be provided as an in-kind contribution to signify community ownership and responsibility for the facility once completed. When local governments control the land it is anticipated that the land will be donated to the grantee in perpetuity for the benefit of the community. In case of pipeline easements, a land transfer may not be required. If the project will be located on land re-conveyed from the ANCSA Native Corporation to the community for community use or expansion purposes, it is anticipated that the re-conveyed land would be donated. Donated land should be recognized in the grant agreement as an in-kind contribution.

3. Denali Commission Policies

See Appendix H for the Denali Commission Policies.

II. EXISTING POWER GENERATION FACILITY

A. FACILITY DESCRIPTION

Kwethluk Incorporated's electrical utility, Kuiggluum Kallugvia, operates the power plant that provides electrical power to the community. The plant consists of four detached modules, and is located on the east side of the community. One module houses the switchgear and controls, and each of the other three modules houses a generator. The modules are wood frame structures, with metal exterior siding and plywood covered interior walls. The modules are supported by timber foundations and experience differential movement during the seasonal freeze-thaw cycles. Heat is not recovered at the existing power plant.

The plant has three generators, two 270 kW generators and a 350 kW generator. At the time this report was prepared only the 350 kW generator was operable. One of the 270 kW generators was temporarily out of service, and the other 270 kW generator has been out of service for more than two years. As of January 2007, the 270 kW generator temporarily out of service had 574,564 hours of service, and the 350 kW generator had 139,759 hours of service. The plant operator said the generators were well maintained. The generators are not configured to run in parallel; therefore, the plant's total capacity is 350 kW continuous.

The plant's generators are supplied with fuel oil by day tanks located inside the modules. The day tanks draw fuel oil from a 5,000 gallon intermediate tank located 50 feet northeast of the plant. Buried steel piping connects the intermediate tank to the community's collocated tank farm, located approximately 300 feet south of the plant. The intermediate tank was purchased and installed as part of the 2006 bulk fuel upgrades. See Figure 1 for a Location Map.

B. EXISTING ELECTRICAL DISTRIBUTION SYSTEM

Errico Electrical Engineering evaluated the existing electrical distribution system as a part of this report. The village of Kwethluk's distribution system contains both three-phase and single-phase, medium voltage, overhead, 7,200/12,470 V circuits. The system is comprised of approximately 144 poles. The existing power plant feeds 3 three-phase step-up transformers mounted on a pole supported platform. The distribution system is in good condition. See Appendix A for the Electrical Distribution System Report by Errico Electrical Engineering.

PHOTOGRAPHY BY AEROMAP, U.S.
DATE OF PHOTOGRAPHY: JUNE 24, 2000

FIGURE 1 - LOCATION MAP

ALASKA ENERGY AUTHORITY

RURAL POWER SYSTEM UPGRADE
KWETHLUK, ALASKA

LCMF LLC
610 E. 82nd Ave. Suite 200 Anchorage, AK 99515 272-1830

CONCEPTUAL DESIGN REPORT

REVISIONS:

DRAWN BY: DAR
CHECKED BY:
DATE: 03/15/07
JOB NUMBER: 06-764
SCALE: 1" = 500'

DRAWING TITLE:

SHEET: OF

III. PROJECTED ELECTRICAL CONSUMPTION (DEMAND)

In order to project future electrical demand, several factors affecting demand were identified and analyzed. These factors are projected population growth, the historical relationship between demand and season, artificial restrictions to consumption (such as storage shortfall/rationing), projected new sources of demand (outside of historical norms), and access to and potential use of alternative energies.

A. POPULATION GROWTH

Federal census data taken from the Alaska Department of Community and Economic Development database shows a population growth from 1990 to 2000 of 27.8% for the 10-year period, or an annualized growth rate of 2.5% per year.

Alaska Department of Labor data shows a population growth from 1991 to 2005 of 25% for the 14 year period, or an annualized growth rate of 1.6% per year. Trend analysis of the Department of Labor data indicates a 14% growth rate over the next 10 years, or an annualized growth rate of 1.3% per year. See Appendix G for Department of Labor population estimates and trend line analysis.

The Alaska Department of Labor has projected population growth in the Bethel Census Area in which Kwethluk is located. These projections predict the Bethel Census area will grow 22% between the years 2008 and 2018, or 2.0% per year.

In 2002 Calista Regional Corporation conducted a regional energy study in which population projections were made. Historically the Calista Region has grown at 2.2% per year from 1970 to 2000. The study predicted the population for the Calista Region to increase by 17% in the next 10 years. The study also predicted the population for the village of Kwethluk to increase by 15% for the 10 year period between 2005 and 2015. This equates to an annualized growth rate of 1.4% per year.

The population data gathered from the Federal Census, and the State of Alaska Department of Labor, and LCMF LLC's trend analysis is shown in the following tables:

Historical Population Data

Source	Period				Period Growth Rate %	Annualized Growth Rate %
	From Year	Population	To Year	Population		
Federal Census	1990	558	2000	713	27.8	2.5
State Department of Labor (ADOL)	1991	555	2005	695	25.2	1.6

Projected Population Estimates

Source	Period				Period Growth Rate %	Annualized Growth Rate %
	From Year	Population	To Year	Population		
LCMF LLC Trend Analysis of ADOL Historical Data for Kwethluk	2007	753	2017	859	14.1	1.3
ADOL Projections for Bethel Census Area	2008	N/A	2018	N/A	22.4	2.0
Calista Energy Study Projections for Calista Region	2005	N/A	2015	N/A	16.7	1.6
Calista Energy Study Projections for Kwethluk	2005	760	2015	871	14.6	1.4

Based on the above data a 2.0% annualized population growth rate for Kwethluk, or an equivalent 10 year growth rate of 22%, is recommended as a conservative projection of future electrical demand and fuel consumption based on population growth.

B. ENERGY DEMAND/HISTORICAL CONSUMPTION TRENDS

Data for monthly peak loads, electrical consumption, and fuel consumption for the existing power plant over the past twelve years was extracted from Power Cost Equalization (PCE) data supplied by the Alaska Energy Authority. A historical analysis was performed on the data from fiscal year 1995 through fiscal year 2006. The analysis shows the community experienced a 25% increase in electrical consumption and an 18% increase in peak loads during that time period; however, these growth rates have been skewed by the existing power plant's limited power generation capacity which has forced the community to ration electrical power in recent years. See Appendix F for PCE data and a historical electrical demand worksheet.

C. PRODUCTION SHORTFALL / RATIONING

The power plant operator, Harry Jackson, and Kwethluk Incorporated Business Manager, George Guy, have noted that the community has been forced to ration electrical power. When the existing power plant nears its power generation capacity the power plant operator transmits messages to the community via VHF radio requesting the public to shut off non-essential appliances. Also, outages occur monthly through the winter season. Rationing and outages are a good indication that the community's electrical power generation facilities are not meeting the community's electrical power demand.

D. NEW SOURCES OF DEMAND

Sources of increased electrical demand such as construction activities, new homes, new infrastructure, and changes in or upgrades to existing infrastructure all have potential impacts on future energy demand and consumption. To find out which, if any, of these potential sources are anticipated, the following entities were contacted and asked to provide estimates of planned activities:

- **State of Alaska Department of Transportation (Airport)** – A new airport was recently constructed in Kwethluk. Airport facilities include a beacon, runway lighting, PAPI, REIL, plug-ins, and an equipment building. Future upgrades may include an automated weather station. Michael Stoianoff, with the State Department of Transportation estimated the current peak loads for the airport facilities to be 20 kW, and the future peak loads to be 30 kW.
- **Lower Kuskokwim School District** – The community's existing power plant provide power to the school and school housing units. The school has a 125 kW standby generator, and the housing units have a 35 kW standby generator. Roger Larson, with the Lower Kuskokwim School District, verified that there are no planned upgrades that would have a significant impact on the school facilities electrical demand.
- **Alaska Native Tribal Health Consortium (ANTHC)** – The community does not have piped water or sewer systems. The State of Alaska Department of Commerce, Community and Economic Development's Capital Projects Database indicates that piped water and sewer systems have been funded. Construction of these facilities would significantly increase the community's electrical demand. For planning purposes it is assumed the piped water systems would include a water treatment plant and two wells, the sewer system would include four lift stations and a force main to pump the sewage to a lagoon, and the service lines would be protected with 12,000 feet of electrical heat trace. The sewer system could include a sewage treatment plant, but most rural sewer systems do not provide the level of treatment that requires a plant. The peak loads of these facilities are conservatively estimated to be:

Water Treatment Plant	100 kW	
Well Pumps	15 kW	(2 each 7.5 hp pumps)
Lift Station Pumps	30 kW	(4 each 7.5 hp pumps)
Heat Trace	60 kW	(12,000 feet at 5 W/foot)

The total peak load of a piped water and sewer system is estimated to be 205 kW.

- **Local Housing Authority** – Kwethluk Tribal Resident Council Incorporated, the local housing authority, plans to build 4 to 6 houses per year. The peak load per home is estimated to be 2.0 kW. New home construction could increase the community's peak loads 8 – 12 kW per year, resulting in a peak load increase of 80-120 kW by the year 2017.

E. ALTERNATIVE SOURCES OF ENERGY/EFFICIENCIES

In order to accurately address future fuel consumption based on energy demand, viability of potential alternative energy sources must be considered. For this report the following potential energy sources were briefly analyzed:

- **Heat Recovery**

  Heat is not recovered at the existing power plant. A new power plant should include heat recovery. Recovered heat could be used to heat water at the school's water plant. The school's water plant is within 1,000 feet of the proposed power plant. The school's Owner, the Lower Kuskokwim School District (LKSD), has requested a cost-benefit analysis be conducted before including school facilities in any future heat recovery systems. The school district wants to ensure the costs it incurs to utilize the recovered heat will be offset by reduced fuel oil costs.

- **Wind Energy**

  The Alaska Energy Authority Alternative Energies group reviewed the wind energy potential in Kwethluk and determined that the community of Kwethluk appears to be a fair candidate for wind power. According to the draft wind energy atlas for Alaska produced by the National Renewable Energy lab, Kwethluk lies in an area with wind power classes of 3 and 4. Wind power classes from 4 to 7 are believed to be viable for generation of electricity by wind turbines.

  In February 2007 the community requested that the Alaska Energy Authority install a wind monitoring tower at a potential wind turbine site to determine the quality of their wind resource. Alaska Energy Authority assisted in the installation of a wind monitoring station in Bethel, 10 miles southwest of Kwethluk. Data collected from December 2004 to July 2005 indicated an average wind speed of 14.7 mph at a height of 100 feet above ground level. These wind speeds suggest that Bethel lies within a Class 5 or 6 wind regime. See Appendix E for Wind Power Density Maps.

- **Hydroelectric**

  Research for this report did not find any hydroelectric plants operating on the Kuskokwim River, or data relating to the feasibility of generating hydroelectric power on the river. A Bethel census area energy narrative located on the State of Alaska Department of Commerce, Community and Economic Development website noted no hydroelectric projects are generating utility power in the Bethel census area.

- **Alternative Fuels**

  Kuiggluum Kallugvia, the electrical power provider, currently utilizes diesel #1 as its generator fuel source. Use of diesel #2 has proven to provide increases in BTU production per gallon of fuel used in power generation facilities by a factor of 1.05 and up.

  The heating value of diesel #2 is 140,000 BTUs/gallon and diesel #1 is 133,000 BTUs/gallon (approximations based upon common fuel mixtures used in western Alaska). Using electrical consumption projections within this report, the projected consumption of diesel #1, for production of electricity in 2017, would be approximately 222,000 gallons. Based on the above heating values, a conversion to diesel #2 would reduce the projected fuel consumption of to approximately 211,000 gallons, resulting in an annual reduction in fuel consumption of 11,000 gallons. Assuming a fuel cost of $4.00/gallon for both products, this conversion could result in savings of $44,000 or more in annual operating funds.

  However, diesel #2 is less resistant to waxing (separation) at low temperatures, and must be maintained at minimum temperatures to be successfully utilized. Consequently, a substantial upfront cost may be required to maintain minimum fuel temperatures during cold periods, or use of diesel #2 may be restricted to only the warmer months of the year. As such, the economic viability of using diesel #2 is questionable based on the conditions in Kwethluk, and will not be incorporated into fuel storage requirements for this report. Even so, the economics of using diesel #2 should be revisited at a later date.

  No other alternative fuels exist locally in significantly enough quantities to be considered.

- **Geothermal Energy**

  Based on a review of the 1983 and 2003 U.S. Department of Energy map of Alaska Geothermal Resources, no geothermal energy sources are available to the community of Kwethluk.

- **Efficiency Improvements (Energy Audit Recommendations)**

  AEA provided End Use Recommendation Assessments to the community in 1997 discussing cost effective upgrades to lighting and heating systems in the clinic, store, school, and washeteria. The conservation impacts of the recommendations are not substantial enough to include in the projected electrical consumption.

  Data supplied by the Alaska Energy Authority for the years 1995 to 2006 showed that the community's power plant is generating 13.5 kWh of electrical power per gallon of diesel fuel. With higher efficiency engines, improved switchgear and more efficient generator sizing, it is assumed that an efficiency of 14 kWh per gallon can be achieved.

F. PROJECTED ELECTRICAL DEMAND

Historical data for Kwethluk indicates that from 1995 to 2006 population increased 8%, electrical consumption increased 25%, and peak loads increased 18%. While population and peak loads fluctuated over the 11-year period, electrical consumption grew steadily.

Demand sources such as new housing and commercial development are assumed to be reflected in the normal long term population growth rate, based on State of Alaska Department of Labor projections of 2.0% annually.

Connecting the piped water and sewer facilities previously discussed in this report to the community's electrical distribution system will increase electrical consumption and peak loads significantly. Bringing these facilities online could increase peak loads by as much as 205 kW. Although funding is currently in place for design and construction of piped water and sewer systems, the systems have not been designed, and it is feasible to assume the facilities will not be constructed within the next five years. Including piped water and sewer systems in the projected electrical demand may result in over sizing a new power plant; however, not including the systems could result in under sizing the plant. For the purposes of this report it is assumed that a piped water and sewer system will be installed within the next ten years. Although a new power plant would not need the additional power generation capacity necessary to supply electrical power to piped water and sewer systems within the next five years, the plant should be designed to efficiently add the additional power generation capacity necessary when the systems are installed.

Since the community has been forced to ration electrical power in recent years, estimating future electrical power demand resulting from population growth by applying a 2% annual growth factor to the current demand would not accurately reflect future demand. To project the community's electrical power demand in fiscal year 2017, LCMF used a trend line analysis of historical peak loads from fiscal years 1995 to 2004. Available peak load data for fiscal years 2005 and 2006 was not used in the analysis because rationing during those years made the data suspect. The trend line analysis predicted a peak load of 305 kW in January 2007.

A 2.0% annual increase was used for projecting electrical demand over the next ten years, with the new water treatment plant, new water distribution and sewage collection systems, and airport upgrades added as step increases. Starting with the trend line peak load of 305 kW in December 2006 (FY 2007), and projecting an annual growth rate of 2.0% gives a 372 kW peak load in December 2016 (FY 2017). Adding the step increases results in a projected peak demand to 607 kW in FY 2017.

The following table summarizes peak load projections through FY 2017.

Kwethluk Peak Load Projections			
Source	**FY 2007 Peak Load** (kW)	**Projected Growth Rate** (%)	**FY 2017 Peak Load** (kW)
Trend Line	305	2	372
Piped Water and Sewer System	-	-	205
Airport	20	-	30
Total Demand	**325**		**607**

The existing power plant does not have the capacity to accommodate this projected growth in demand and should be replaced. See Appendix F for an electrical demand worksheet, LCMF trend line analysis, and PCE data.

IV. PROPOSED NEW FACILITY

A. SITE SELECTION

The site selected for construction of a new power plant is located within Lot 3, Section 5, Township 8 North, Range 69 West, Seward Meridian, Alaska, and is adjacent to the recently constructed fuel oil tank farm. This section was conveyed to Kwethluk Incorporated by interim conveyance dated July 12, 1979. See Appendix B for the site control opinion. See Figure 1 for a Location Map.

Locating the new power plant near the existing power plant and fuel oil tank farm will reduce the costs associated with connecting the plant to the existing power distribution system and fuel oil supply. Connecting to the existing power distribution system will require less than 300 feet of overhead power line, and connecting to the fuel supply piping will require less than 200 feet of piping. Also, the site is in close proximity to the school which will facilitate piping recovered heat to the school facilities.

Locating the new power plant near the new water treatment plant will improve the efficiency of furnishing recovered heat to the new water treatment plant. By recovering heat generated during the power generation process, the village can significantly reduce the amount of fuel oil used at the water treatment plant; thereby reducing the water treatment plant's operating and maintenance costs.

B. SITE CONTROL

Site Control for this report was provided by Rick Elliott, Land Consultant. Mr. Elliot concluded that based on the available public records, the site selected for the proposed power plant is owned by Kwethluk Incorporated. See Appendix B for the site control opinion. On February 15, 2007 Kwethluk Incorporated offered to donate the portion of the site necessary for construction of a new power plant to the project.

C. SOIL CONDITIONS

The proposed power plant is on the same lot as the recently constructed bulk fuel tank farm. Duane Miller Associates performed a geotechnical exploration as a part of the bulk fuel tank farm project. The exploration was limited to the portion of the site impacted by the tank farm; however, since the proposed power plant is within 150 feet of the tank farm, and has the same vegetative cover as the tank farm, it is likely the soil strata at the proposed power plant is similar to the soil strata found at the tank farm.

The community is underlain by discontinuous permafrost. The proposed power plant should be located on a site that is entirely underlain by frozen or unfrozen soils. A field investigation should be conducted at the selected site to determine the subsurface soil conditions. After determining the soil conditions a foundation can be designed. See

Appendix C for a copy of Duane Miller and Associates geotechnical exploration report for the bulk fuel tank farm in Kwethluk, Alaska.

D. COMMUNITY FLOOD DATA

The U.S. Army Corps of Engineers, Flood Plain Management Services, Alaska Communities flood hazard data website notes that the community of Kwethluk is subject to flooding, that flooding occurs from both ice jams and high runoff, and that some flooding occurs annually. See Appendix D for the flood hazard data.

E. LOCAL FILL MATERIAL

Local fill materials are not available. Sands and gravels will probably have to be barged from Bethel or Kalstag. Approximately 500 cubic yards of gravel fill material is stockpiled in the community. The material was barged to the community as a part of the recent bulk fuel tank farm project and is owned by Kwethluk Incorporated. On February 15, 2007 Kwethluk Incorporated offered to donate the gravel to a new power plant project.

F. POWER GENERATION BUILDING FOUNDATION

The site is expected to be underlain with sands and moderately compressible silts. If the subgrade soils at the site are found to be thawed and capable of directly supporting the structural loads, a gravel pad and warm slab on grade foundation could be constructed. If the soils are not able to directly support the loads a pile foundation would be necessary. For the purposes of this report both options will be reviewed and considered.

A gravel pad would be constructed by stripping the vegetation from the site, excavating the organic soils (assumed to be one foot thick), placing a woven geotextile over the exposed subgrade, and installing four feet of silty sand fill.

An assumed pile foundation design would use twenty six (26) 10 inch schedule 40 pile, driven to a minimum depth of 40 feet. The structural platform would be constructed using steel structural members and plate. This foundation option would also incorporate some amount of gravel pad construction, to be utilized as an access to the proposed power plant.

The design engineer should ultimately select the foundation option, based on further investigations.

G. POWER GENERATOR BUILDING

The building will be a 36 foot by 48 foot metal structure. It will be insulated, and have interior partitions to close off work areas from the generator noise. The building's main structural members will be steel. The building will house the generators and all

associated switchgear. The building will include a waste heat recovery system. See Appendix J for conceptual design drawings illustrating the proposed building.

H. FUEL SYSTEM

The Corporation, electric utility, and school's fuel tanks are collocated at a tank farm located 300 feet north of the existing power plant. The tank farm was constructed in 2006, and has seventeen 23,800 gallon vertical tanks and a 3,500 gallon, double-walled, dual product, dispensing tank. The following table details the tank owner, user, product, and capacities.

Number of Tanks	Owner	User	Product	Shell Capacity	Usable Capacity
6	Kwethluk Incorporated	Power Generation	Diesel	23,800	21,420
4	Kwethluk Incorporated	Heating Oil	Diesel	23,800	21,420
1	Kwethluk Incorporated	Dispensing	Diesel/ Gasoline	1,750 1,750	1,575 1,575
5	Kwethluk Incorporated		Gasoline	23,800	21,420
2	LKSD		Diesel	23,800	21,420

Kwethluk Incorporated has a usable fuel storage capacity of 324,500 gallons. Currently, 128,520 gallons (approximately 40%) of that is used to produce electricity.

Prior to construction of the collocated tank farm the village received two or more fuel deliveries each year. With the additional storage capacities provided by the collocated tank farm, the power plant has a fuel oil storage capacity of 128,500 gallons. The power plant consumed 109,000 gallons of fuel oil in fiscal year 2006. The power plant's current storage capacity is 18 % greater than its current consumption rate. The design of the tank farm included space to construct another tank with a 23,800 gallon shell capacity. If more reserve capacity is desired for the power plant, another tank should be included as part of this project.

The two school tanks located at the collocated tank farm provide heating oil storage for the school, and are not available to provide additional fuel oil storage for the proposed power plant.

Annual growth and new projects coming online are projected to increase peak loads by 320 kW from FY 2005 through FY 2017. Assuming a fixed relationship between peak loads and average loads, this increase would result in a corresponding increase in annual kWh consumption from 1,400,000 in FY 2005 to 3,000,000 by FY 2017. Based on historical fuel efficiency data taken from 1995 – 2006 PCE reports the existing power plant is producing 13.5 kWh per gallon of diesel fuel (1,143,000 gallons to produce 15,457,000 kWh). Using this historical efficiency, the proposed power plant would consume 222,000 gallons of fuel in the FY 2017 (3,000,000 kWh/13.5 gallons/kWh).

The existing power plant's 5,000 gallon intermediate tank was installed as a part of the recent bulk fuel upgrade project. As part of this project the tank should be reinstalled at the proposed power plant site. The tank is equipped with the following overfill prevention measures:

- Float actuated fill limiting switch
- High level pump shut-off switch
- Critical high level alarm
- Liquid level gauge and
- Whistle vent

I. GENERATORS AND SWITCHGEAR

A power generation capacity of 1,100 kW is recommended for the proposed power plant. After subtracting the step increases resulting from the proposed piped water and sewer systems, and airport improvements, this is a 260% increase from the existing generation capacity. The 1,100 kW capacity can be provided by installing four generators with individual capacities of 370, 370, 230, and 230 kW. The generators will feed new load sensing switchgear, and pad mounted, step up transformers. The generators are sized to handle the projected peak loading, after the loss of the single largest generator. Additional load monitoring is required to properly size the generators, and should be included in the final design of the power plant.

J. CONNECTION TO EXISTING ELECTRICAL DISTRIBUTION SYSTEM

At the new power plant, it is proposed to install two banks of pad-mounted single-phase transformers connected externally to step-up the voltage to distribution level of 7,200/12,470 V. Each bank should have one spare transformer, stored on site, to facilitate quick re-establishment of power due to the loss of a single transformer. The transformer banks will be sized to match the loads of the feeders they serve.

K. UPGRADES TO ELECTRICAL DISTRIBUTION SYSTEM

The system as a whole is in good repair with the exception of many NESC code violations noted during the electrical field evaluation performed in conjunction with this report. Some of the items requiring correction are listed below.

- All street light brackets should be grounded.
- The primary lines should be retensioned, especially in the southern part of the village where sags were greatest.
- Number un-numbered poles.
- All telecommunication guys and messengers should be bonded to pole grounds and electrical guying.
- Replace photocells on poles where streetlights are on during daylight hours.

See Appendix A for the Electrical Distribution System Report by Errico Electrical Engineering.

L. OWNERSHIP AND OPERATION

The proposed power generation facility will be owned and operated by Kwethluk Incorporated. The existing distribution system is also owned by Kwethluk Incorporated. United Utilities Incorporated owns the telecommunication lines in the village, and leases pole usage from Kwethluk Incorporated,

M. PERMITTING

The construction and operation of the new power plant requires the following permitting:

1. Coastal Project Questionnaire

Since Kwethluk is located in a coastal zone, the project requires submittal of a Coastal Project Questionnaire to the State of Alaska, Department of Natural Resources (DNR). The DNR coordinates review of the questionnaire by various state agencies and assists in identifying required permits pertinent to the project. The standard review spans a 30-day period.

2. Fire Marshal Review

The construction of the new power generation facility will require submittal of a complete set of construction documents to the State of Alaska, Department of Public Safety, Division of Fire Prevention (Fire Marshal) for plan review and approval. The State Fire Marshal then issues a Plan Review Certificate to verify compliance with adopted Building, Fire, and Life Safety codes. Final stamped drawings must be submitted along with the application fee for project review. Anticipate a minimum of one month before comments may be received from the Fire Marshal.

3. United States Army Wetlands Permit

Projects that place fill material in wetlands require an Application for Department of the Army Permit to be submitted to the U.S. Army Corps of Engineers, Alaska District, before construction begins. It will be necessary for the Corps of Engineers to review this project to determine if the selected building site is considered to be wetlands. The standard review period varies from 30 to 90 days.

4. Federal Aviation Administration Review

Power plants located less than 5 miles from a runway or airport, such as this project, should complete Form 7460-1, "Notice of Proposed Construction or Alteration", and submit all necessary elevation and height of structure information to the Federal Aviation Administration (FAA), Alaska Region, prior to construction. The FAA reviews the project and determines if the project will present a hazard to air traffic in the vicinity. The FAA has typically provided project determinations within one month of the completed form submittal.

5. State of Alaska, Department of Environmental Conservation Review

The Alaska Department of Environmental Conservation (ADEC) regulates the operation of diesel power generation facilities by a consistency review process. The Application for Pre-Approved Limit Diesel Generation Facility must be submitted prior to the facility startup, provided that the nitrogen oxide emissions do not exceed 100 tons/year. The review is set up to accommodate future growth of a power plant, provided that growth is requested during the initial application, and it does not exceed the 100 ton/year of nitrogen oxide emissions. Power plants which fall into the sizes necessary for Alaska villages will not exceed the 100 ton/year emission level.

6. Regulatory Commission of Alaska Certification

The Regulatory Commission of Alaska regulates public utilities by certifying qualified providers of public utility and pipeline services, and ensuring that they provide safe and adequate services and facilities at just and reasonable rates, terms, and conditions. This keeps rates as low as possible while allowing the utility to earn a fair return. The commission also determines the eligibility and the per kilowatt-hour support for electric utilities under the Power Cost Equalization program.

7. State of Alaska Historical Preservation Office

The State Historic Preservation Office is required, under Section 106 of the National Historic Preservation Act, to review any state or federally funded project to determine if the project will disturb historical or cultural resources.

8. United States Fish and Wildlife Service

The United States Fish and Wildlife Service will review the project to determine what effect the project will have on endangered species.

N. CONSTRUCTION METHOD

Construction of the new power plant is to be competitively bid. The Alaska Energy Authority will publicly solicit bids to construct the new power plant and upgrade the existing power distribution system.

1. Local labor

Skilled labor is available in the community.

2. Local Equipment

Construction equipment is not available in the village.

O. SCHEDULE

Each foundation option will dictate different schedules.

Gravel Pad Foundation Option:

Since the available soils will contain a significant amount of moisture the gravel pad should be given time to drain and consolidate for a period of one year before the power plant is constructed. For this reason the project is divided into two phases. Phase 1 includes the design, permitting, and construction of the gravel pad. Phase 2 includes the design, permitting, and construction of the power plant.

Phase 1 – Construct Gravel Pad

- Design and Permit Gravel Pad — May-June 2008
- Mobilize Equipment and Materials for Gravel Pad Construction — July 2008
- Construct Gravel Pad — August 2008
- Demobilize Equipment and Materials used for Gravel Pad Construction — September 2008

Phase 2 – Construct Power Plant

- Design and Permit Power Plant — Winter 2008/2009
- Procurement — Spring 2009
- Mobilize Equipment and Materials for Power Plant Construction — June 2009 - August 2009

- Begin Power Plant Construction June 2009
- End Power Plant Construction September 2009
- Demobilize Equipment and Materials used for Power Plant Construction September 2009

Pile Foundation Option:

As the pad area in this option will not be structural, pre-construction of the pad will not be necessary, and all work will be conducted in a single season.

- Design and Permitting Winter 2007/2008
- Procurement Spring 2008
- Mobilize Equipment and Materials for Construction June 2008 - August 2008
- Begin Construction June 2008
- End Construction September 2008
- Demobilize Equipment and Materials used for Construction September 2008

Note: The proposed schedules are very dependent upon many inter-related factors, such as project start time, material availability and weather. If any of these items creates a delay, the project may run into the following season, which will increase the construction costs. In order to address this potential delay and increased cost, a 10% construction contingency should be used in cost estimating for the project.

P. BUDGET LEVEL COST ESTIMATES

Budget level cost estimates, based on each foundation option, have been prepared for constructing the power plant and upgrading the existing electrical distribution system as presented in this report. Equipment rental rates are based on historical rental rates for similar equipment. The construction cost estimates are based on a competitive bid process. The total budget estimates also include costs associated with design, legal, and project management, and a construction contingency of 10%. The total cost for the project, utilizing a gravel pad foundation, is estimated to be $3,510,063.00. The total project cost, using a pile foundation, is estimated to be $3,453,800.00

The cost of upgrading the existing electrical distribution system is based on a cost estimate provided by Errico Electrical Engineering. See Appendix I for the budget level cost estimates.

APPENDIX A

ELECTRICAL DISTRIBUTION SYSTEM REPORT
BY ERRICO ELECTRICAL ENGINEERING

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August 7, 2007

Joe Daniels
LCMF, LLC
615 East 82nd Ave., Suite 200
Anchorage, Alaska 99518

Re: Kwethluk Electrical Distribution condition survey -finalized

Dear Mr. Daniels:

I visited the City of Kwethluk, on Friday February 16 to Sunday February 18th, to review the electrical distribution facilities for evaluation of the existing system and to provide recommendations on corrections to the electrical distribution system for NESC code compliance, to better meet industry standards, and to suggest possible deficiencies in the system that might have been related to several recent outages.

Summary:

Kwethluk's electrical distribution system in general is in good condition. Facilities not in compliance with the current NESC code or items requiring correction are noted (see below). The relatively new line out to the airport requires minor adjustments/improvements to better assure reduced future maintenance costs for this line. The power plant step-up pole-platform mounted transformers are too low. About half the street lights were damaged, non-functioning or malfunctioning. While indoors during my visit, several electrical system disturbances affected my perception of the interior lighting system luminance, and several Villager shared concerns about recent power outages. When I was in Kwethluk, the City's distribution system power was supplied from one diesel generator. A second diesel generator was un-available for dispatch due to a recent malfunction. Other older generators are not functional. Improvements to the generating facilities would have the greatest impact on increasing the reliability of the distribution system along with re-tensioning of some of the primary circuits in the village (mostly the West side of the City) and other non-major distribution improvements.

Where in this report reference to coordination with the telecommunications for correction with telephone utility, it should be interpreted to adjust the electrical facilities where they extend into the telecommunication space on the pole, and that where the telecommunication facilities are in the electric supply space should be responsible for relocating their facilities to the telecommunication space by an individual qualified to work in both spaces on the pole. This work is

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not included in the cost estimate, as this cost should be borne by the telecommunications provider.

General recommendations:

1) All street light brackets should be grounded.
2) The primary should be retensioned, especially in the southern part of the village where the sags were greatest.
3) Number un-numbered poles.
4) All telecommunication guys and messengers to be bonded to pole grounds and electrical guying.
5) Where poles are noted to have photocell replaced, streetlights were on in daylight.

Location specific recommendations:

Beginning at the airport heading toward the City:
1) The service lift pole at the airport, to be referred to as (tbrta) D7-4-29A – the secondary crossing the access road on its southerly side should be tightened or raised to provide required secondary clearance over the road (see item 2).

2) The primary deadend pole tbrta D7-4-29 is guyed in two directions to back up the primary to the East and the secondary to the West. Both anchor rods project ~30" out of the ground. The pole is leaning into line angle between the primary and the secondary. Recommend adding fill to the existing anchors, straightening the pole and providing a new bisector guy, which will help maintain primary tensions in the pole's backspan; and maintain secondary clearance over the road in the pole's frontspan (after re-tensioning the secondary, see item above). Straightening the pole and guying it to prevent further leaning will also help mitigate the leaning of the primary pole in its backspan (see item 3).

3) The second primary pole tbrta D7-4-28 is an angle structure framed vertically and deadended in both directions. It is leaning into its guys (away from the line angle). Straighten this pole in conjunction with the adjacent deadend pole, still being gently raked against the angle, but with its conductors directly in-line with its backspan poles (see items 2 & 3).

4) The next five poles tbrta D7-4-27, D7-4-26, D7-4-25, D7-4-24 and D7-4-23 toward the City are framed tangent. The first three are leaning in the same direction as D7-4-28, and require straightening. Adjustments to D7-4-28 will help prevent further leaning of these poles (see item 3). Trim neutral bolt on pole D7-4-27.

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5) Poles tbrta D7-4-22, D7-4-21, and D7-4-20 are respectively framed small angle, tangent, small angle. Pole tbrta D7-4-21 is leaning away from the road and needs to be straightened. The guy on pole tbrta D7-4-20 is loose—tighten guy.

6) Pole tbrta D7-4-19: trim neutral bolt.

7) Pole tbrta D7-4-18: add fill over anchor rod (extends 18" above grade).

8) Pole tbrta D7-4-17: trim neutral bolt.

9) Pole tbrta D7-4-16: is framed as an angled double deadend and is leaning into the angle. Straighten pole; recommend installing a bisector guy. Provide pole number.

10) Pole tbrta D7-4-15: trim neutral bolt. Provide pole number.

11) Poles tbrta D7-4-14 and D7-4-13: provide pole number.

12) Pole tbrta D7-4-12: add fill over anchor rod (extends 18" above grade).

13) Pole tbrta D7-4-11: trim neutral bolt. Provide pole number.

14) Poles tbrta D7-4-10, D7-4-9, D7-4-8, D7-4-7, D7-4-6, and D7-4-5: provide pole number.

15) Pole tbrta D7-4-4: Install a guy bonding clamp (peanut) in the anchor rod-eye. Provide pole number.

16) Poles tbrta D7-4-3 and D7-4-2: provide pole numbers.

17) Pole tbrta D7-4-1: Ground guy and install peanut. Place fill over anchor. Provide pole number.

18) Pole tbrta D7-4-1A: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Ground guy and install peanut. Add fill over anchor. Provide pole number.

19) Pole D7-4 (begins existing pole numbering): Ground telecommunication messenger and guy.

20) Pole tbrta D7-4-1R: trim neutral bolt. Provide pole number.

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21) Poles tbrta D7-4-2R, D7-4-3R, and D7-4-4R: provide pole numbers.

22) Pole tbrta D7-4-5R: Raise low service drop. Install peanut. Re-drive ground rod. Add more staples on pole ground. Provide pole number.

Restarting at pole D7-4:

23) Pole D7-5: Straighten pole; add guy stub pole and span guy. Replace street light glass or fixture.

24) Pole D7-6: Straighten pole; add guy stub pole and span guy. Ground guy and install peanut. Place fill over anchor.

25) Pole D7-6A: Ground guy and install peanut. Place fill over anchor.

26) Pole D7-7: Straighten pole; add guy stub pole and span guy.

27) Pole tbrta D7-7A: Provide pole number.

28) Pole tbrta D7-8: Provide slack on secondary at pole—it is tight against pole and will abrade insulation. Straighten pole; add guy stub pole and span guy. Provide pole number.

29) Pole tbrta D7-9: Straighten pole; add guy stub pole and span guy. Add fill around base of pole. Tighten loose guy ground and install peanut. Provide pole number.

Restarting at pole D7-4:

30) Pole D7-3: Trim neutral bolt. Replace street light glass.

31) Pole D7-2: Relocate neutral to bottom of spool. Telephone line to electric line clearance is insufficient at pole. Coordinate correction with telephone utility. Uncover buried anchor rod eye; install peanut if absent. Install peanut on second guy.

32) Pole D7-2A: Raise secondaries to pole. Uncover anchor rod eye; add peanut if absent.

33) Pole D7-1: no comment.

34) Pole D7.5: Uncover anchor rod eye; install peanut if missing.

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35) Pole D-7: Telephone line to electric line clearance is insufficient at pole. Coordinate correction with telephone utility. Install second tank ground. Re-drive ground rod. Add staples on pole ground. Uncover anchor eye and install peanut if absent.

36) Pole D6: Telephone line to electric line clearance is insufficient at pole. Coordinate correction with telephone utility. Uncover buried anchor eye; install peanut if absent. Ground secondary guy. Ground tele guy. Replace photocell.

37) Pole D6-1: Service to school is low at attachment. Reduce drip loops. If service is 277/480—raise service. Straighten pole and add guy. Uncover buried anchor rod eye; install peanut if absent. Add second tank grounds. Replace broken guy preformed deadend. Install missing guy marker.

38) Pole D6A: Telephone line to electric line clearance is insufficient in service span to building. Coordinate correction with telephone utility. Straighten pole and add guy. Replace missing street light bulb.

39) Pole D3: Ground guy. Uncover buried anchor eye; install peanut if absent.

40) Pole D5: Trim neutral upset bolt.

41) Pole D47: Uncover anchor rod eye; install peanut if absent. Relocate pole further North to correct clearance to overbuilt primary and to correct insufficient clearance to telecommunications in span to pole D4.

42) Pole CO2: Raise secondary to correct insufficient clearance to telecommunications in both front and back span.

43) Pole CO1: Ground guy and install peanut.

44) Pole D4: Coordinate correction with telephone utility to correct clearance between guy and telephone (currently touching). Uncover buried anchor eye; install peanut if absent. Re-drive ground rod. Ground guy. Replace street light glass.

45) Pole D4-1: Replace street light glass.

46) Pole D4-2: Ground span guy. Add second transformer tank ground.

47) Poles tbrta D4-2-1X and D4-2-1Y: Raise transformer platform. Raise feeders from power plant. Provide pole numbers.

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48) Pole D4-2A: Ground span guy. Install missing guy marker. Re-work riser to make it not readily climbable.

49) Pole D4-3: Telephone line to electric line clearance is insufficient in span and at pole. Coordinate correction with telephone utility. Install more staples on pole ground.

50) Pole D4-4: Replace broken street light bulb.

51) Pole D4-5: Telephone line to electric line clearance is insufficient at pole. Coordinate correction with telephone utility. Trim secondary eyebolt. Replace broken street light glass.

52) Pole D4-6: Replace street light glass.

53) Pole D4-7: Telephone line to electric line clearance is insufficient in front-span to D4-8. Coordinate correction with telephone utility. Replace street light glass. Ground guys and install peanuts.

54) Pole D4-7A: Telephone line to electric line clearance is insufficient at service span. Coordinate correction with telephone utility. Raise service—could raise on poles, increase tension, install mast guy.

55) Pole D4-8: Telephone line to electric line clearance is insufficient in backspan to D4-7. Coordinate correction with telephone utility.

56) Pole D4-9 (D4-5L-2B): Retire second pole number. Glass off meter socket. Ground guys and install peanuts. Telephone line to electric line clearance is insufficient to street light. Coordinate correction with telephone utility.

57) Pole D4-10: Replace street light bulb and glass. Raise service.

58) Pole D4/11: Re-drive ground rod. Uncover buried anchor eye; install peanut if absent.

59) Pole tbrta D4-11-1: Install meter or glass off (new home). Provide pole number.

60) Pole D2-1: Renumber D4-11A. straighten pole and guy. Raise low service or retire (service glassed off). Telephone line to electric line clearance is insufficient in service span. Coordinate correction with telephone utility.

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61) Pole D1: Renumber D4-11B. Install guy marker. Ground guys and install peanuts. Add fill over anchor.

62) Pole tbrta D4-11C: Raise low service. Telephone line to electric line clearance is insufficient in service span. Coordinate correction with telephone utility. Reinstall or replace guy. Ground guy and add fill over anchor. Provide pole number.

Restarting at pole D4-5:

63) Pole D4-5L-1: Replace street light bulb.

64) Pole D4-5L-2: Ground span guy and install peanut.

65) Pole D4-5L-2A: Install guy marker. Ground guy and install peanut. Add fill over anchor.

66) Pole tbrta D4-5L-2B: Ground guy and install peanut. Reinstall or replace guy marker. Provide pole number.

67) Pole D4-5L-3: Ground span guy. Uncover anchor rod eye; install peanut if absent.

Restarting at pole D4-5:

68) Pole D4-5-1: Telephone line to electric line clearance is insufficient over building. Coordinate correction with telephone utility. Install guy marker and install peanut.

68) Pole tbrta D4-5-1A: Telephone line to electric line clearance is insufficient at building for all services. Coordinate correction with telephone utility. Ground guys and install peanuts. Replace street light glass. Provide pole number.

70) Pole D4-5-2: Install peanut. Cover anchor with fill. Replace streetlight glass.

71) Pole tbrta D4-5-2A: Ground guys and install peanuts. Provide pole number.

72) Pole D4-5-3: Ground guy and install peanut. Replace guy marker. Re-drive ground rod. Replace street light glass and bulb.

73) Pole D4-5-3-1:Install street light bulb.

74) Pole D4-5-3-2: Ground guy and install peanut. Cover anchor with fill.

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75) Pole D4-5-4: Telephone line to electric line clearance is insufficient—guy rubbing on tele sidewalk mast arm. Coordinate correction with telephone utility. Install peanut.

76) Pole tbrta D4-5-4A: Ground guy. Telephone line to electric line clearance is insufficient for all services in span at building attachment. Coordinate correction with telephone utility. Provide pole number.

77) Pole D4-5-5: Ground secondary guy. Install peanuts. Re-drive ground rod. Replace street light glass and bulb. Place fill over anchor.

78) Pole D4-5-6: Raise service over building. Telephone line to electric line clearance is insufficient at service span over building. Coordinate correction with telephone utility.

79) Pole D4-5-7: Ground guys and install peanuts. Place fill over anchors. Telephone line to electric line clearance is insufficient in service span near building. Coordinate correction with telephone utility.

80) Pole D4-5-7-1: Ground guy and install peanut. Place fill over anchor. Telephone line to electric line clearance is insufficient in both service spans near building. Coordinate correction with telephone utility.

81) Pole tbrta D4-5-8: Telephone line to electric line clearance is insufficient at pole. Coordinate correction with telephone utility. Ground guy and install peanut. Provide pole number.

From the Westerly part of the City Restarting at pole D7.5:

82) Pole D8: Telephone line to electric line clearance is insufficient at mid-span to D7.5. Coordinate correction with telephone utility. Ground guy and install peanut. Replace photocell.

83) Pole D7-1A (behind school): Ground guy and install peanut.

84) Pole tbrta D8A: Ground guy and install peanut. Add fill over anchor. Correct low clearance over roof (intermediate mast might be required). Provide pole number.

85) Pole D9: Telephone line to electric line clearance is insufficient at mid-span to D8. Coordinate correction with telephone utility. Add fill over anchor and install

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peanut on exposed guy. Uncover buried anchor rod eye on two other guys and install peanuts if absent. Install missing guy marker. Replace photocell.

86) Pole D9-1: Telephone line to electric line clearance is insufficient at service. Coordinate correction with telephone utility.

87) Pole D10: Uncover anchor rod eye and install peanut if absent. Add fill over second anchor and install peanut.

88) Pole D11: Re-drive ground rod. Ground guy and install peanut. Replace broken street light glass. Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. **Coordinate replacement of consumer owned meterbase cover.**

89) Pole tbrta D11-1: Telephone line to electric line clearance is insufficient at northwest service span. Coordinate correction with telephone utility. Correct insufficient service clearance over roof/adjacent house at two services. Replace street light glass. Provide pole number.

90) Pole D12: no comment.

91) Pole D13: Re-drive ground rod. Install second transformer tank ground.

92) Pole D13-1: Correct service clearance over roofs. Replace photocell.

93) Pole D13-1A: Straighten pole and guy.

94) Pole D14: Ground secondary guy. Install peanut.

95) Pole tbrta D14A: Raise or retire service to glassed off meter. Ground guy and install peanut. Replace photocell. Provide pole number.

96) Pole D15: Uncover buried eye. Install peanut. Raise service.

97) Pole tbrta D15A: Install guy marker and peanut. Provide pole number.

98) Pole D16: Install peanuts.

99) Pole tbrta D16A: Install peanut. Provide pole number.

100) Pole tbrta D16AA: Ground guy and install peanut. Provide pole number.

101) Pole tbrta D16AB: Provide pole number.

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102) Pole D17: Install second transformer ground. Replace street light glass.

103) Pole D18: Telephone line to electric line clearance is insufficient at service to northeast and south. Coordinate correction with telephone utility. Install second transformer tank ground. Replace photocell.

104) Pole D19: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Uncover buried anchor rod eye; add peanut if absent. Add fill over second anchor and install peanut.

105) Pole D20: Add peanut.

106) Pole D20-1: Add peanut. Re-drive ground rod.

107) Pole tbrta D20-1-1R: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Uncover buried anchor rod eye. Trim bolt. Replace street light—glass and photocell broken. Provide pole number.

108) Pole tbrta D20-1-1RA: Raise low service drop. Replace street light—glass and photocell broken. Provide pole number.

109) Pole tbrta D20-1XL: Raise low service drop. Provide pole number.

110) Pole tbrta D20-1LA: Straighten and guy leaning pole. Raise low service drop. Provide pole number.

111) Pole tbrta D20-1LB: Straighten and guy leaning pole. Raise low service drop. Provide pole number.

112) Pole tbrta D20-2: Straighten and guy leaning pole. Add second tank ground to transformer. Provide pole number.

113) Pole D20-2A: Raise low service drop. Replace photocell.

114) Pole tbrta D20-3: Raise low service drop or retire—meter has been glassed off. Provide pole number.

115) Pole tbrta D20-3A: Provide pole number. Provide pole number.

116) Pole D21: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Straighten and guy leaning pole. Replace broken photocell.

ERRICO
ELECTRICAL
ENGINEERING, LLC

PO Box 220471
Anchorage, Alaska 99522
Ph/Fx: (907) 345-6168
Cell: (907) 242-7669
Email: errico@gci.net

117) Pole D22: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Correct low clearance over roof (intermediate mast might be required). Re-drive ground rod.

118) Pole D23: Telephone line to electric line clearance at pole is insufficient. Coordinate correction with telephone utility. Replace photocell.

119) Pole D23-A1 (tbrta D23-A1X): Straighten and guy leaning pole. Re-drive ground rod. Re-bond broken ground. Trim bolt on J6. Re-number pole.

120) Pole D23-A1 (tbrta D23-A1Y): Install missing guy marker. Correct low clearance over roof (intermediate mast might be required). Replace photocell. Add peanut. Renumber pole. Provide pole number.

121) Pole D23-2A: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Correct low clearance over roof (intermediate mast might be required). Raise low service drop or retire—meter has been glassed off. Replace street light—missing glass.

122) Pole D23-1: Telephone line to electric line clearance is insufficient. Bond guy and telephone messenger. Coordinate corrections with telephone utility. Replace photocell.

123) Pole D23-1A: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Uncover buried anchor rod eye; install peanut if absent. Raise low service drops to north and southwest over roofs (intermediate mast might be required).

124) Pole D23-2: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Service clearance over road is also insufficient. Straighten and guy pole with short lead or sidewalk guy. Replace photocell.

125) Pole D23-3: Uncover buried anchor eye. Install peanut if absent. Bond ground to guy.

126) Pole tbrta D23A: Telecommunication line is resting on service to west, and telephone line to electric line clearance is insufficient at other service. Coordinate correction with telephone utility. Bond ground to telecommunications. Provide pole number.

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127) Pole tbrta D24A-1L: Telephone line to electric line clearance is insufficient at service. Coordinate correction with telephone utility. Ground guy. Retire connection to Pole D24A—resting on line at crossing between pole tbrta D23A and pole tbrta D24. Provide new connection to pole tbrta D23A.

128) Pole D24A: To avoid crossing of lines mentioned for D24A-1L and to pole tbrta D24A-1R below, Pole D24A could be retired with power rerouted as described for the other two poles.

129) Pole tbrta D24A-1R: Ground guy and install peanut. If line to D24A is retired, provide new connection to line from pole D24-1A. Provide pole number.

130) Pole tbrta D24A-2R: Raise weatherhead. Coordinate/require consumer to increase height of weatherhead. Provide pole number.

131) Pole tbrta D24: Correct low clearance over roof (intermediate mast might be required) at service to north. Raise low service drop to southeast. Provide pole number.

132) Poles tbrta D24XA (3 clustered poles): Raise secondary clearance over roof. Re-drive ground rod. Ground southern guy and install peanut. Install guy marker. Ground span-guy. Ground tele guy and messenger. Trim bolts. Recommend reworking and retiring two poles. Provide pole number.

133) Pole tbrta D24-1: Telephone line to electric line mid-span clearance is insufficient on two services. Coordinate correction with telephone utility. Provide pole number.

134) Pole tbrta D24-1A: Telecommunications is above secondary. Correct mid-span clearance between electric and telecommunications—recommend raising secondary and lowering telecommunications below electrical. Provide pole number.

135) Pole tbrta D24-2: Raise low service drop to north. Correct low clearance over roof (intermediate mast might be required) at service to northeast.

136) Pole tbrta D24-2A: Telephone line to electric line clearance is insufficient. Coordinate correction with telephone utility. Provide pole number.

137) Pole tbrta D24-2B: Retire riser and exposed conductor at meterbase. Provide guy. Provide pole number.

138) Pole D25: no corrections required.

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139) Pole tbrta D25A: Provide pole number.

140) Pole tbrta D25B: Provide pole number.

141) Pole tbrta D26: Replace photocell. Provide pole number.

142) Pole tbrta D26A: Replace photocell. Provide pole number.

143) Pole tbrta D27: Replace broken streetlight. Provide pole number.

144) Pole tbrta D28: Straighten pole and provide additional pole guy. Provide pole number.

Although there are a lot of individual comments, the overall electrical distribution system in general is in good condition. If you have any questions regarding this report, please do not hesitate to call me.

Regards,

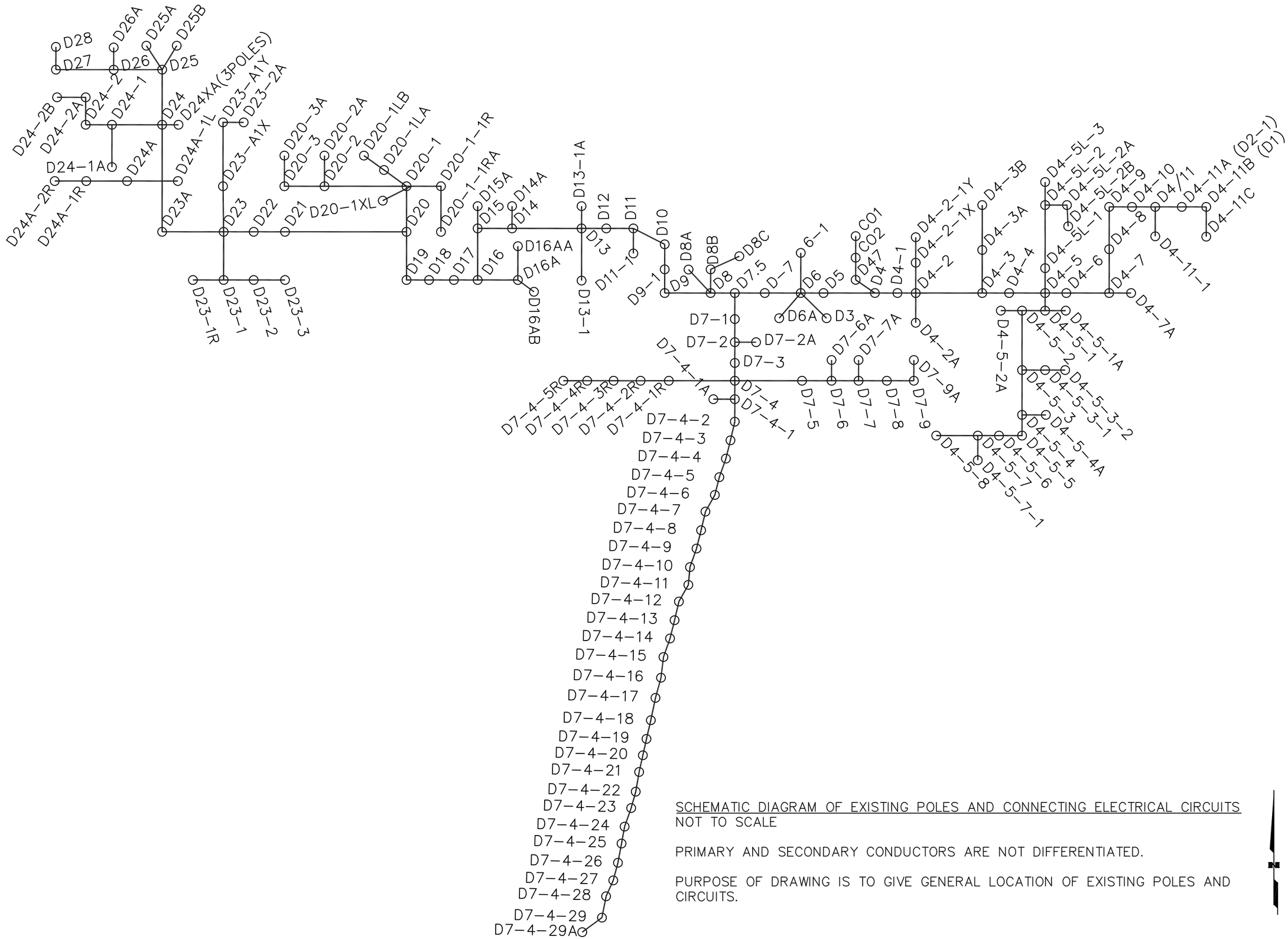
Gregory M. Errico, PE

Attachments: Cost estimate, schematic pole layout

	UNIT or TASK	QUANTITY	LABOR HOURS	LABOR RATE	LABOR COST	MATERIAL COST/UNIT	MATERIAL COST	MATERIAL WEIGHT	FREIGHT	EXTENDED COST
CONSTRUCTION	RAISE SERVICE	33	1.25	$175	$7,219	$5.0	$165	0.4	$7	$7,390
	RAISE SECONDARY	11	1.5	$175	$2,888	$5.0	$55	0.28	$2	$2,944
	STRAIGTHEN POLE	26	4	$175	$18,200	$0.0	$0	0.11	$1	$18,201
	INSTALL DOWN GUY	19	0.75	$175	$2,494	$115.0	$2,185	30	$285	$4,964
	INSTALL SPAN GUY	5	1.25	$175	$1,094	$135.0	$675	35	$88	$1,856
	GROUND GUY	39	0.25	$175	$1,706	$10.0	$390	5	$98	$2,194
	INSTALL GUY MARKER	10	0.25	$175	$438	$17.5	$175	5	$25	$638
	INSTALL ANCHOR	18	6	$175	$18,900	$70.0	$1,260	50	$450	$20,610
	ADD PEANUT	63	0.25	$175	$2,756	$5.0	$315	5	$158	$3,229
	PLACE FILL	20	2.5	$175	$8,750	$100.0	$2,000		$0	$10,750
	TRIM BOLT	13	0.25	$175	$569	$0.0	$0	0	$0	$569
	POLE NUMBER	72	0.5	$175	$6,300	$2.0	$144	1	$36	$6,480
	RE-DRIVE ROUND ROD	12	1	$175	$2,100	$5.0	$60	0	$0	$2,160
	ADD STAPLES TO POLE GROUND	3	0.25	$175	$131	$3.0	$9	5	$8	$148
	REPAIR STREETLIGHT	35	1	$175	$6,125	$70.0	$2,450	40	$700	$9,275
	POLE 40/4	5	10	$175	$8,750	$750.0	$3,750	400	$3,000	$15,500
	INSTALL TRANSFORMER TANK GROUND	9	1.25	$175	$1,969	$7.5	$68	5	$23	$2,059
	RAISE PLATFORM MOUNTED TRANSFORMER BANK	1	24	$175	$4,200	$2,000.0	$2,000	500	$250	$6,450
	REWORK RISER	1	2	$175	$350	$25.0	$25	30	$15	$390
	RETIRE POLE	3	4	$175	$2,100	$0.0	$0	0	$0	$2,100
	TENSION PRIMARIES	3	14	$175	$7,350	$250.0	$750	250	$375	$8,475
LINE EXTENSION DESIGN	Line Extension Design -Staking sheet, bid tab, specifications, and drawing creation	1	50	$107	$5,350					$5,350
	Site visit to complete/finalize construction documents(including transportation)	1	60	$107	$7,020					$7,020
CONSTRUCTION ENGINEERING	Quality Assurance during construction (including transportation) - if desired	1	50	$107	$6,550					$6,550
	Facility Asbuilding Documentation (including transportation - not incuding survey) - if desired	1	40	$107	$4,280					$4,280

Labor rate chosen includes contractors labor overhead including transportation and lodging.

Subtotal	$149,581
Contingency	1.25
Estimated cost of Electrical Distribution Upgrade	$186,976.34



SCHEMATIC DIAGRAM OF EXISTING POLES AND CONNECTING ELECTRICAL CIRCUITS
NOT TO SCALE

PRIMARY AND SECONDARY CONDUCTORS ARE NOT DIFFERENTIATED.

PURPOSE OF DRAWING IS TO GIVE GENERAL LOCATION OF EXISTING POLES AND CIRCUITS.

PLOTTING DATE: 00/00/96
XREF:

ELECTRICAL DISTRIBUTION SYSTEM

CONDITION SURVEY LAYOUT DIAGRAM

KWETHLUK, ALASKA

LCMF LLC
139 E. 51st Ave. · Anchorage, Alaska 99503 · (907)275-1800
PO Box 230471
Anchorage, AK 99523
(907) 345-6188
Cell: (907) 242-7669
Email: mrricoe@gci.net
PERRICO ELECTRICAL ENGINEERING, LLC

CONDITION SURVEY

REVISIONS:

DRAWN BY: ME
CHECKED BY: GE
DATE: 3-16-07
JOB NUMBER:
DWG FILE:

DRAWING TITLE:
SCEMATIC DIAGRAM OF EXISTING POLES AND ELECTRICAL CIRCUITS

SHEET: 1 OF 1

E1

APPENDIX B

SITE CONTROL OPINION
BY RICK ELLIOTT

Site Control Opinion
Rural Power System Upgrade Project
Kwethluk, Alaska

As requested, I have reviewed the land status for the proposed bulk fuel system upgrade project in Kwethluk, Alaska. This report is for a proposed power plant.

Land Status Report
Land records were researched at the Bureau of Land Management (BLM), the State Department of Commerce and Economic Development, and the State Recording Office. Research of the BLM and the State Recording Office information was conducted on line. A limited liability report dated September 2, 2004, prepared by Pacific Northwest Title was also reviewed. A copy of the report is attached.

The proposed site is located just outside the federal townsite, U.S. Survey 4221, and is within Lot 3, Section 5, Township 8 North, Range 69 West, Seward Meridian. This section was conveyed to Kwethluk Incorporated by Interim Conveyance #213 dated July 12, 1979. The conveyance was recorded in the Bethel Recording District on June 6, 1980, at Book 28, Page 106. There have been some subdivisions and transfers of title within Section 5 but the proposed site appears to be in the unsubdivided remainder of Lot 3, Section 5. Kwethluk Incorporated has retained title to this area. A copy of the interim conveyance is included in the limited liability report referenced above. Recorder's Office information was researched on line by legal description and by name from the date of the limited liability report to the present. There was nothing found that indicated any change of ownership from what was documented in the report.

Site Control Summary. The project area appears to be owned by Kwethluk Incorporated.

Disclaimer: This site control opinion does not purport to insure, warrant or certify title. This opinion is not a legal opinion. The research of the Bethel Recorders Office records was limited to a review of the computerized files. The opinion is the result of a diligent research effort as described above.

Prepared by

Rick Elliott
Land Consultant for CRW
March 5, 2007

PACIFIC NORTHWEST TITLE
OF ALASKA, INC.

LIMITED LIABILITY REPORT

ORDER NO.: **00073581**

RICK ELLIOTT
5452 CAPE SEVILLE DRIVE
ANCHORAGE, AK 99516

Date: **September 21, 2004**
Reference: **Kwethluk**

This is a Limited Liability Report as of **September 02, 2004 at 8:00 am** on the following described property:

See Exhibit A Attached hereto and made a part hereof

A search of the records of the Bethel Recording Office by this Company reveals that title to the property described herein is vested on the date shown above in:

See Exhibit A Attached hereto and made a part hereof

SUBJECT only to the exceptions shown herein:

GENERAL EXCEPTIONS:

1. Encroachments or questions of location, boundary and area, which an accurate survey may disclose; public or private easements, claims of easements or encumbrances which are not disclosed by the public records including but not limited to rights of the state and/or public in and to any portion of the land for right of way as established by federal statute RS 2477; rights or claims of persons in possession, or claiming to be in possession, not disclosed by the public records; material or labor liens or statutory liens under State Acts not disclosed by the public records; water rights or matters relating thereto; any service, installation or construction charges for sewer, water or electricity.
2. Right of use, control or regulation by the United States of America in the exercise of powers over navigation; defects, liens, encumbrances, or other matters created or suffered by the insured; rights, claims based upon instruments or upon facts not disclosed by the public records but of which rights, claims, instruments or facts the insured has knowledge.
3. General taxes not now payable; matters relating to special assessments and special levies, if any, preceding the same becoming a lien.
4. Mining claims, reservations or exceptions in patents or in Acts authorizing the issuance thereof.
5. Any law, ordinance or governmental regulation (including but not limited to building and zoning laws, ordinances, or regulations) restricting, regulating, prohibiting or relating to (i) the occupancy, use or enjoyment of the land; (ii) the character, dimensions or location of any improvement now or hereafter erected on the land; (iii) a separation in ownership or a change in the dimensions or area of the land or any parcel of which the land is or was a part; or (iv) environmental protection, or the effect of any violation of these laws, ordinances or governmental regulations, except to the extent that a notice of the enforcement thereof or a notice of a defect, lien or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Report.
6. "Consumer Credit Protection," "Truth in Lending" or similar law, or failure to comply with said law(s).
7. Any claim by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws.

Exhibit A

PARCEL 1

VESTING:

KWETHLUK INCORPORATED, an estate in fee simple.

LEGAL DESCRIPTION:

That portion of Section 5, Township 8 North, Range 69 West, Seward Meridian, located in the Bethel Recording District, Third Judicial District, State of Alaska, bounded on the North by U.S. Survey No. 4221, Townsite of Kwethluk, bounded on the East by Kwethluk South Subdivision, according to Plat 89-12, bounded on the South by New Kwethluk Housing Subdivision, Addition No. 1, according to Plat 2000-27 and bounded on the West by the East line of a metes and bounds parcel described in Quitclaim Deed recorded May 12, 1998 in Book 79 at Page 326 and by Corrected Quitclaim Deed recorded January 15, 2003 in Serial No. 2003-000103.

EXCEPTING THEREFROM the subsurface estate and all rights, privileges, immunities and appurtenances of whatsoever nature, accruing unto said estate pursuant to the Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688, 704; 43 U.S.C. 1601, 1613 (f) (1976), as reserved by the United States of America.

PARCEL 2 N/A

VESTING:

ORGANIZED VILLAGE OF KWETHLUK, KWETHLUK INDIAN REORGANIZATION ACT COUNCIL, an estate in fee simple.

LEGAL DESCRIPTION:

That portion of Section 5, Township 8 North, Range 69 West, Seward Meridian, located in the Bethel Recording District, Third Judicial District, State of Alaska, more particularly described as follows:

Commencing at Corner No. 2, Tract A, U.S. Survey 4221; thence, along the south line of U.S. Survey 4221, S89°23'W for 343.00 feet to the True Point of Beginning; thence, departing S0°37'E for 250.00 feet; thence, S89°23'W for 200.00 feet; thence N0°37'W for 250.00 feet to an intersection with the south line of said U.S. Survey 4221; thence along said south line, N89°23'E for 200.00 feet to the True Point of Beginning.
(As described in Corrected Quitclaim Deed recorded January 15, 2003 in Serial No. 2003-000103)

EXCEPTING THEREFROM the subsurface estate and all rights, privileges, immunities and appurtenances of whatsoever nature, accruing unto said estate pursuant to the Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688, 704; 43 U.S.C. 1601, 1613 (f) (1976), as reserved by the United States of America.

SPECIAL EXCEPTIONS:

1. EXCEPTIONS, RESERVATIONS, AGREEMENTS, EASEMENTS AND USE RIGHTS as set forth in Interim Conveyance No. 213:
   Dated: July 12, 1079
   Recorded: June 6, 1980
   Book/Page: 28/106

   Amended by instrument
   Recorded: November 21, 1985
   Book/Page: 42/297

2. TERMS, COVENANTS, CONDITIONS AND PROVISIONS, including rights of way and easements, as contained in the Alaska Native Claims Settlement Act, dated December 18, 1971, U.S. Public Law 92-203, (85 Stat. 688, 704; 43 U.S.C. 1601, et seq.).

   NOTE: No assurance is given as to the vertical delineation of the surface and subsurface estates in said land as provided in said Act.

3. ANY DEFECT OR INVALIDITY of the title to said land based on the fact that no patent has been issued by the United States of America. Upon the issuance of said patent and recordation thereof in the herein named recording district, said land will be subject to all the provisions and reservations contained therein
   Recording District: Bethel

4. DISCREPANCIES, CONFLICTS IN BOUNDARY LINES, SHORTAGE IN AREA, ENCROACHMENTS OR OTHER FACTS which a correct survey would disclose, and which are not shown by the public records. Upon recording of a U.S. Patent confirming the boundary description by the Bureau of Land Management, this exception may be removed.

5. AGREEMENT FOR JOINT USE OF POLES, including the terms and conditions thereof
   By and Between: Kwethluk, Inc. and United Utilities, Inc.
   Dated: April 19, 1990
   Recorded: July 7, 1997
   Book/Page: 76/238

6. EASEMENT, including the terms and conditions thereof
   In Favor Of: Kwethluk I.R.A. Council
   Recorded: April 28, 2003
   Serial No.: 2003-000846
   For: Construction, maintenance and on-going management of Kwethluk I.R.A. Council owned Utilidor, including Water & Vacuum Sewer Lines and all related appurtenances
   Affects: South 15 feet Parcel 2, see instrument for full metes and bounds description.

SPECIAL EXCEPTIONS
(Continued)

7. EASEMENT, including the terms and conditions thereof

In Favor Of:	Kwethluk I.R.A. Council
Recorded:	April 28, 2003
Serial No.:	2003-000847
For:	Construction, maintenance and on-going management of Kwethluk I.R.A. Council owned Utilidor, including Water & Vacuum Sewer Lines and all related appurtenances
Affects:	South 15 feet of the West 218.00 feet of Parcel 1, see instrument for full metes and bounds description.

NOTE: Not within a real property taxing area at this time.

This report is restricted to the use of the addressee and is not to be used as a basis for closing any transaction affecting title to said property. Liability of the Company is limited to the compensation received therefor.

CHARGE: **$300.00**

PACIFIC NORTHWEST TITLE
OF ALASKA, INC.

By: _____
Authorized Signature
Howard Hancock, Phone: 261-2230

September 21, 2004
Attachments
hh

F-14885-A

INTERIM CONVEYANCE

WHEREAS

Kwethluk Incorporated

is entitled to a conveyance pursuant to Secs. 14(a) and 22(j) of the Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688, 702, 715; 43 U.S.C. 1601, 1613(a), 1621(j) (1976)), of the surface estate in the following described lands:

Seward Meridian, Alaska (Unsurveyed)

T. 6 N., R. 67 W.
Secs. 4 and 5, all;
Secs. 8 and 9, all;
Secs. 16 and 17, all;
Secs. 20, 21 and 22, all;
Secs. 27 and 28, all;
Sec. 31, all;
Sec. 34, all.

Containing approximately 8,309 acres.

T. 7 N., R. 67 W.
Sec. 1, all;
Sec. 2, excluding Native allotment F-17072 Parcel C;
Secs. 3 to 7, inclusive, all;
Secs. 11 and 12, all;
Secs. 17 to 20, inclusive, all;
Secs. 28, 29 and 30, all;
Secs. 32 and 33, all.

Containing approximately 11,307 acres.

T. 8 N., R. 67 W.
Secs. 5 to 9, inclusive, all;
Secs. 17 to 20, inclusive, all;
Secs. 29, 30 and 31, all;
Sec. 32, excluding Native allotment F-029105 Parcel B;
Secs. 33 to 36, inclusive, all.

Containing approximately 10,660 acres.

T. 6 N., R. 68 W.
Secs. 1 to 9, inclusive, all;
Sec. 10, excluding Native allotment F-17216;
Secs. 11 to 14, inclusive, all;
Sec. 15, excluding Native allotments F-17050 Parcel B and F-17216;
Sec. 16, all;
Secs. 22 and 23, all;
Sec. 24, excluding Native allotment F-19254 Parcel B;
Sec. 25, excluding Native allotments F-16016 and F-17204 Parcel B;
Sec. 26, all;
Sec. 35, all;

Interim Conveyance No. 213

Date JUL 12 1979

6-6-80

F-14933-A

Sec. 36, excluding Native allotments F-16016 and F-16008 Parcel A.

Containing approximately 14,027 acres.

T. 7 N., R. 68 W.
Secs. 1 and 2, all;
Sec. 3, excluding Native allotment F-17212 Parcel B;
Secs. 4 to 7, inclusive, all;
Sec. 8, excluding Native allotments F-17221 Parcel B, F-17210 Parcel C, and F-17222;
Sec. 9, excluding Native allotment F-17222;
Sec. 10, excluding Native allotment F-17212 Parcel C;
Secs. 11 and 12, all;
Sec. 13, excluding Native allotment F-16015;
Secs. 14 and 15, all;
Sec. 16, excluding Native allotments F-17214 Parcel A and F-17057 Parcel A;
Sec. 17, excluding Native allotment F-17214 Parcel A;
Sec. 18, excluding Native allotment F-17072 Parcel B;
Sec. 19, excluding Native allotments F-17061 Parcel A, F-16807 Parcel B, and F-16803;
Sec. 20, excluding Native allotments F-16803, F-17214 Parcel A, and F-17015 Parcel A;
Sec. 21, excluding Native allotments F-17214 Parcel A and F-16013 Parcel A;
Secs. 22 to 27, inclusive, all;
Sec. 28, excluding Native allotment F-16724 Parcel C;
Secs. 29 to 36, inclusive, all.

Containing approximately 21,655 acres.

T. 8 N., R. 68 W.
Secs. 1 to 18, inclusive, all;
Sec. 19, excluding Native allotment F-17099 Parcel B;
Secs. 20 to 27, inclusive, all;
Sec. 28, excluding Native allotments F-19262 Parcel A and F-17099 Parcel A;
Sec. 29, excluding Native allotments F-19262 Parcel A and F-17211;
Sec. 30, excluding Native allotments F-17099 Parcel B, F-19262 Parcel B, F-025345 Parcel B, F-17073 Parcel A, and F-17060 Parcel B;
Sec. 31, excluding Native allotment F-17212 Parcel D;
Sec. 32, excluding Native allotments F-17212 Parcel D and F-17211;
Sec. 33, excluding Native allotments F-17073 Parcel B, F-17212 Parcel A, and F-16009;
Secs. 34, 35 and 36, all.

Containing approximately 21,769 acres.

T. 9 N., R. 68 W.
Sec. 22, excluding the Kuskokuak Slough and Native allotments F-16595 and F-16592;
Sec. 23, excluding the Kuskokuak Slough and Native allotment F-16592;

Interim Conveyance No. 213

Date JUL 12 1979

T. [illegible], R. [illegible], excluding the Kuskokuak Slough;
Sec. 17, excluding the Kuskokuak Slough and Native allotment F-[illegible] Parcel B;
Sec. 18, excluding the Kuskokuak Slough and Native allotment F-[illegible];
Sec. [illegible], excluding the Kuskokuak Slough;
Sec. 30, excluding the Kuskokuak Slough and Native allotment F-17206 Parcel B;
Sec. 31, excluding the Kuskokuak Slough and Native allotment F-17050;
Sec. 32, excluding the Kuskokuak Slough and Native allotments F-17090 and F-17214 Parcel B;
Sec. 33, excluding the Kuskokuak Slough;
Sec. 34, all;
Sec. 35, excluding the Kuskokuak Slough and Native allotments F-17213, F-17069, and F-17215;
Sec. 36, excluding the Kuskokuak Slough and Native allotments F-17069 and F-17215.

Containing approximately 7,030 acres.

T. 7 N., R. 69 W.
Sec. 1, all;
Sec. 2, excluding Native allotment F-16182 Parcel A;
Sec. 3, excluding Native allotment F-17219 Parcel A;
Sec. 11, excluding Native allotments F-16181 Parcel A, F-16481 Parcel B, F-17607, and F-16182 Parcel B;
Sec. 12, excluding Native allotments F-17050 Parcel C and F-17052 Parcel B;
Sec. 13, excluding Native allotment F-17210 Parcel B.

Containing approximately 3,217 acres.

T. 8 N., R. 69 W.
Sec. 1, excluding Native allotment F-17207;
Sec. 2, excluding the Kuskokuak Slough;
Sec. 3, excluding the Kuskokuak Slough and Native allotment F-17214 Parcel B;
Sec. 4, excluding the Kuskokuak Slough, Tract C of U.S. Survey No. 4221 and Native allotments F-17211 Parcel A, F-16481 Parcel A, F-17057 Parcel B, and F-17072 Parcel A;
Sec. 5, excluding the Kuskokuak Slough, Tracts A, C and D of U.S. Survey No. 4221, and Native allotments F-17094 Parcel B, F-17050 Parcel A, and F-17070 Parcel A;
Sec. 6, excluding the [illegible] Kuskokuak Slough, Tracts A, B and [illegible] of U.S. Survey [illegible] and Native allotments F-17056 [illegible] Parcel B, F-[illegible] Parcel A, F-[illegible] Parcel C, F-17219 Parcel B and F-13559 Parcel A;
Sec. 7, [illegible] Native allotments F-[illegible] A, F-[illegible] Parcel A, and F-[illegible] Parcel A;
Sec. 8, all;
Sec. [illegible], [illegible] A;

28 ASE 108

[illegible]

Sec. 27, excluding the Kuskokwim Slough and [illegible] Parcel B;
Sec. 28, [illegible] Slough and [illegible];
Sec. 29, [illegible] Slough;
Sec. 30, [illegible] and [illegible] Parcel B;
Sec. 31, excluding the Kuskokwim Slough and [illegible];
Sec. 32, [illegible] of the [illegible] and F-17214 Parcel B;
Sec. 33, excluding the Kuskokwim Slough;
Sec. 34, all;
Sec. 35, excluding the Kuskokwim Slough and Native allotments F-[illegible], F-17069, and F-17215;
Sec. 36, excluding the Kuskokwim Slough and Native allotments F-17069 and F-17215.

Containing approximately 7,080 acres.

T. 7 N., R. 69 W.
Sec. 1, all;
Sec. 2, excluding Native allotment F-16182 Parcel A;
Sec. 3, excluding Native allotment F-17219 Parcel A;
Sec. 11, excluding Native allotments F-16181 Parcel A, F-16482 Parcel B, F-17607, and F-16182 Parcel B;
Sec. 12, excluding Native allotments F-17050 Parcel C and F-17052 Parcel B;
Sec. 13, excluding Native allotment F-17210 Parcel B.

Containing approximately 3,217 acres.

T. 8 N., R. 69 W.
Sec. 1, excluding Native allotment F-17207;
Sec. 2, excluding the Kuskokuak Slough;
Sec. 3, excluding the Kuskokuak Slough and Native allotment F-17214 Parcel B;
Sec. 4, excluding the Kuskokuak Slough, Tract C of U.S. Survey No. 4221 and Native allotments F-17221 Parcel A, F-16481 Parcel A, F-17057 Parcel B, and F-17072 Parcel A;
Sec. 5, excluding the Kuskokuak Slough, Tracts A, C and D of U.S. Survey No. 4221, and Native allotments F-17054 Parcel B, F-17050 Parcel A, and F-17070 Parcel A;
Sec. 6, excluding the Kuskokwim River, Kuskokuak Slough, Tracts A, B and D of U.S. Survey No. 4221 and Native allotments F-17054 Parcel B, F-17076 Parcel A, F-17218 Parcel C, F-17219 Parcel B and F-13559 Parcel A;
Sec. 7, excluding the Kuskokuak Slough and Native allotments F-13559 Parcel A, F-17060 Parcel A, and F-19257 Parcel A;
Sec. 8, all;
Sec. 9, excluding Native allotments F-17072 Parcel A, F-17218 Parcel A, and F-17056

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Parcel B;
Secs. 10 and 11, excluding the Kuskokuak Slough and Native allotment F-16483 Parcel B;
Sec. 12, excluding the Kuskokuak Slough and Native allotments F-17207, F-17217 Parcel A, and F-17206 Parcel A;
Sec. 13, excluding the Kuskokuak Slough and Native allotment F-17066 Parcel B;
Sec. 14, excluding the Kuskokuak Slough and Native allotments F-16724 Parcel B and F-13611;
Sec. 15, excluding the Kuskokuak Slough and Native allotments F-13611, F-17053, and F-17204 Parcel A;
Sec. 16, excluding Native allotments F-18289 Parcel B and F-17217 Parcel B;
Sec. 17, N½; SE¼, excluding Native allotments F-17217 Parcel B and F-17076 Parcel B;
Sec. 18, excluding Native allotment F-17055;
Sec. 19, excluding Native allotment F-19260;
Sec. 20, excluding Native allotments F-13781 Parcel B and F-19260;
Sec. 21, N½; N½S½; S½SW¼, excluding Native allotment F-13781 Parcel B;
Sec. 22, E½, excluding the Kuskokuak Slough and Native allotment F-17053; NW¼; N½SW¼;
Sec. 23, excluding the Kuskokuak Slough and Native allotments F-17067 Parcel B, F-17205, F-13781 Parcel A, and F-17052 Parcel A;
Sec. 24, excluding Native allotment F-17059 Parcel A;
Sec. 25, excluding Native allotments F-14189, F-025345 Parcel B, and F-17078 Parcel A;
Sec. 26, excluding Native allotment F-17054 Parcel A;
Sec. 27, E½, S½NW¼, SW¼;
Sec. 28, S½NE¼; W½, excluding Native allotment F-17015 Parcel C; SE¼;
Sec. 29, excluding Native allotments F-19260 and F-13781 Parcel B;
Sec. 30, excluding Native allotment F-19260;
Secs. 31, 32 and 33, all;
Sec. 34, excluding Native allotment F-17219 Parcel A;
Sec. 35, excluding Native allotment F-17218 Parcel B;
Sec. 36, all.

Containing approximately 17,478 acres.

T. 9 N., R. 69 W.
Secs. 25 and 26, excluding the Kuskokwim River;
Sec. 27, all;
Sec. 34, all;
Sec. 35, excluding the Kuskokwim River and Native allotment F-17079;
Sec. 36, excluding the Kuskokuak Slough and Native allotment F-17050 Parcel A.

Containing approximately 2,905 acres.

T. 8 N., R. 70 W.
Sec. 1, excluding the Kuskokwim River and Native allotment F-13556 Parcel A;

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Secs. 2 and 3, excluding the Kuskokwim River;
Sec. 4, excluding the Kuskokwim River and Church Slough;
Sec. 9, excluding the Kuskokwim River, Church Slough, Tupuknuk Slough, and Native allotment F-17051 Parcel B;
Sec. 10, excluding the Kuskokwim River, Tupuknuk Slough, and Native allotments F-13111, F-17056 Parcel B, F-19256 Parcel A, and F-025345 Parcel A;
Sec. 11, N½, excluding the Kuskokwim River and Native allotment F-13556 Parcel A; SW¼, excluding the Kuskokwim River, Kuskokuak Slough, and Native allotment F-13111;
Sec. 12, excluding the Kuskokwim River, Kuskokuak Slough and Native allotments F-17074 Parcel A, F-13556 Parcel A, F-18288 Parcel A, and F-19257 Parcel A;
Sec. 13, excluding the Kuskokuak Slough and Native allotment F-17074 Parcel B;
Sec. 14, excluding the Kuskokuak Slough;
Sec. 15, excluding Native allotment F-17075;
Sec. 16, excluding the Tupuknuk Slough;
Sec. 21, excluding the Tupuknuk Slough;
Secs. 22 and 23, all;
Sec. 24, excluding Native allotment F-17074 Parcel B;
Secs. 25, 26 and 27, all;
Sec. 28, excluding Native allotment F-17056 Parcel A;
Secs. 33 to 36, inclusive, all.

Containing approximately 12,692 acres.

Aggregating approximately 131,049 acres.

NOW KNOW YE, that there is, therefore, granted by the UNITED STATES OF AMERICA, unto the above-named corporation the surface estate in the land above-described, TO HAVE AND TO HOLD the said estate with all the rights, privileges, immunities, and appurtenances, of whatsoever nature, thereunto belonging, unto the said corporation, its successors and assigns, forever:

EXCEPTING AND RESERVING TO THE UNITED STATES from the lands so granted:

1. The subsurface estate therein, and all rights, privileges, immunities and appurtenances, of whatsoever nature, accruing unto said estate pursuant to the Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688, 704; 43 U.S.C. 1601, 1613(f) (1976)); and

2. Pursuant to Sec. 17(b) of the Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688, 708; 43 U.S.C. 1601, 1616(b) (1976)), the following public easements, referenced by easement identification number (EIN) on the easement maps attached to this document, copies of which will be found in case file F-14883-EE, are reserved to the

Interim Conveyance No. 213

Date JUL 12 1979

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United States and subject to further regulation thereby:

a. (EIN 2 L) A streamside easement twenty-five (25) feet in width upland of and parallel to the ordinary high water mark on all banks and an easement on the entire bed of the Kwethluk River from the point of tidal influence in Sec. 4, T. 8 N., R. 69 W., Seward Meridian, upstream to Sec. 1, T. 5 N., R. 68 W., Seward Meridian. Purpose is to provide for public use of waters having highly significant present recreational use.

b. (EIN 11 C4) A site easement upland of the ordinary high water mark in Sec. 10, T. 6 N., R. 68 W., Seward Meridian, on the left bank of the Kwethluk River. The site is one (1) acre in size with an additional twenty-five (25) foot wide easement on the bed of the river along the entire waterfront of the site. The site is for camping, staging and vehicle use.

c. (EIN 13 C) The right of the United States to enter upon the lands hereinabove granted for cadastral, geodetic, or other survey purposes is reserved, together with the right to do all things necessary in connection therewith.

d. (EIN 14 C) A continuous linear easement twenty-five (25) feet in width upland of and parallel to the mean high tide line in order to provide access to and along the marine coastline and use of such shore for purposes such as beaching of watercraft or aircraft, travel along the shore, recreation, and other similar uses. Deviations from the waterline are permitted when specific conditions so require, e.g., impassable topography or waterfront obstruction. This easement is subject to the right of the owner of the servient estate to build upon such easement a facility for public or private purposes, such right to be exercised reasonably and without undue or unnecessary interference with or obstruction of the easement. When access along the marine coastline easement is to be obstructed, the owner of the servient estate will be obligated to convey to the United States an acceptable alternate access route, at no cost to the United States, prior to the creation of such obstruction.

These reservations have not been conformed to the Departmental easement policy announced March 3, 1978, and published as final rulemaking on November 27, 1978, 43 FR 55326. Conformance will be made at a later date in accordance with the terms and conditions of the agreement dated August 23, 1978 between the Secretary of the Interior, Calista Corporation, and Kwethluk Incorporated.

Interim Conveyance No. 213

Date JUL 12 1979

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THE GRANT OF THE ABOVE DESCRIBED LAND IS SUBJECT TO:

1. Issuance of a patent confirming the boundary description of the lands hereinabove granted after approval and filing by the Bureau of Land Management of the official plat of survey covering such lands;

2. Valid existing rights therein, if any, including but not limited to those created by any lease (including a lease issued under Sec. 6(g) of the Alaska Statehood Act of July 7, 1958 (72 Stat. 339, 341; 48 U.S.C. Ch. 2, Sec. 6(g) (1976))), contract, permit, right-of-way or easement, and the right of the lessee, contractee, permittee, or grantee to the complete enjoyment of all rights, privileges and benefits thereby granted to him. Further, pursuant to to Sec. 17(b)(2) of the Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688; 43 U.S.C. 1601) (1976)), any valid existing right recognized by said act shall continue to have whatever right of access as is now provided for under existing law;

3. Requirements of Sec. 14(c) of the Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688, 703; 43 U.S.C. 1601, 1613(c) (1976)), that the grantee hereunder convey those portions, if any, of the lands hereinabove granted, as are prescribed in said section; and

4. The terms and conditions of the agreement dated August 23, 1978, between the Secretary of the Interior, Calista Corporation and Kwethluk, Incorporated. A copy of the agreement is hereby attached to and made a part of this conveyance document and shall be recorded therewith.

IN WITNESS WHEREOF, the undersigned authorized officer of the Bureau of Land Management has, in the name of the United States, set his hand and caused the seal of the Bureau to be hereunto affixed on this 12th day of July, 1979, in Anchorage, Alaska.

UNITED STATES OF AMERICA

Robert D. Arnold
Assistant to the State Director
ANCSA

Interim Conveyance No. 217

Date JUL 12 1979

APPENDIX C

GEOTECHNICAL CONSULTATION
BY DUANE MILLER & ASSOCIATES

Duane Miller & Associates *Arctic & Geotechnical Engineering*
1041 E. 76th Avenue
Anchorage, Alaska 99518-3215
(907) 644-0510, fax 644-0507

January 26, 2005

CRW Engineering Group
3900 Arctic Boulevard, Ste. 203
Anchorage, Alaska 99503

Attention: Jeff Stanley, P.E.

Subject: Geotechnical Exploration
Bulk Fuel Farm
Kwethluk, Alaska
DM&A Job No. 4084.036

This letter presents the results of our foundation investigation for the proposed bulk fuel farm in Kwethluk, Alaska. To provide data for the design of the facility, CRW Engineering Group has contracted Duane Miller & Associates to conduct a geotechnical exploration including the collection and review of existing geotechnical information from the area, digging and sampling test holes, laboratory testing, and engineering analysis. This work was performed in accordance with our agreement with CRW of November 2, 2004. During the work we have consulted with Messrs. Karl Hulse, P.E., and Jeff Stanley, P.E., engineers with CRW, and Mr. Ron Brown with Alaska Energy Authority. A preliminary discussion of the results of our field investigation, including design considerations for foundation alternatives, was submitted in a memorandum dated December 17, 2004.

The proposed facilities will include 17 vertical fuel tanks within a structural containment system. The containment system will have outside dimensions of about 115 feet by 125 feet, and the toe of the fill pad will extend out about another 15 feet. The perimeter dike will be designed to retain 2 feet of fluid above the gravel pad, and the containment membrane will be buried 1 foot below the surface of the gravel pad. The tanks will be 15 feet in diameter and will be either 18 or 23 feet tall.

Exploration

On November 16 and 17, 2004, Mr. N. Luzny, geologist with DM&A, conducted a subsurface exploration of the proposed fuel tank farm site. A site visit had been previously attempted on November 8 and 9, but inclement weather prevented traveling from Bethel to Kwethluk. Five test pits were excavated using a Komatsu PC200 excavator owned and operated by Kwethluk Tribal Residents Council (KTRC Inc.). The test pits were advanced to depths of 12 to 13.5 feet, the limit of the hoe. The locations of the test pits are shown on Plates 1 and 2, Vicinity Map and Test Pit Locations.

The soil and permafrost conditions were logged and sampled by Mr. Luzny as the test pits were excavated. Soil samples were obtained by grabbing loosened cuttings from the bucket or side walls. Samples were sealed to prevent the loss of moisture and returned to the DM&A laboratory in Anchorage.

In the laboratory, the samples from the test pits were reexamined to confirm field classifications. Samples were tested for moisture content, and representative samples were tested for grain size distribution. A sample of the silt was tested for compaction characteristics using a Harvard Miniature Compaction Apparatus.

In early December, Mr. Stanley made a trip to the site. During the trip he obtained two undisturbed samples of the silt using thin-walled brass tubes that he pushed into the soil. One sample was taken at a depth of 12 inches and the other at 18 inches. He sealed the tubes and returned them to the DM&A laboratory where they were tested for moisture content and density and for compressibility in consolidation tests.

The test pit logs are presented on Plates 3 through 5. The soils have been classified according to the Unified Soils Classification System described on Plate 6. Laboratory test results are shown graphically on the boring log and are tabulated on Plate 7, the Summary of Samples. Particle size data are presented on Plate 8. The results of the consolidation tests are presented on Plates 9 and 10, and the Harvard Compaction test is shown on Plate 11.

Site Conditions

As shown on Plate 1, the site is just south of the intersection of First Street and Airport Road. The area is a relatively flat, well-drained parcel that is heavily wooded with alder brush. Silty ridges ranging from 1 to 2 feet high trend east to west through the site. There is a lower terrace approximately 5 feet below the southern end of the proposed site which reportedly is subject to flooding in the springtime. The lower area was previously mined for the uniform fine-grained sand.≈. At the time of the site investigation, about 1.5 feet of snow covered the site. Photographs of the site are shown on Plate 12.

The site is blanketed with an alder root mat that extends to depths of from a few inches to a foot, below which silt is generally encountered. In the five test pits, we found silt as deep as 9 feet below existing grade. Test Pit No. 4 dug to the east side of the tank farm also had silty sand at 2 feet and then clean sand below 4 feet. Test Pit No. 5, in the middle of the tank farm, and Test Pit No. 2, on the north side, both had silt to a depth of 7 feet. The deepest silt was in Test Pit 3, dug on the west side of the proposed fuel tank farm.

Based on the consolidation tests, the silt is moderately compressible. The dry densities of the tube samples were about 75% of the maximum density determined by the compaction test of the silt. Although one sample of the silt had a moisture content of 21%, most of the silt samples had moisture contents in the range of 31% to 33%. The optimum moisture content for compaction of the silt is about 17%.

In Test Pit No. 1, dug on the south side of the proposed tank farm near the cut bank, sand was present from beneath the root mat to the full depth of 13.5 feet. In the other four pits, sand was found below the silt and extended to the bottom of the holes, 12 to 13.5 feet. The sand appears to be medium dense.

The water table appears to be at about 12 feet based on the wet condition found in Test Pit 1 and the caving at that depth. The water table is expected to be shallower during higher stages of the river.

No frozen ground was encountered to the depths explored. The lack of frozen ground is consistent with brushy sites that DM&A has previously explored at Kwethluk.

Discussion

The fuel tank farm will be developed by stripping the root mat and then placing sand fill to raise the grade about 2 feet. A fuel containment membrane will be placed at that level and then 1 foot of gravel fill will be placed. The 15-foot diameter tanks will be placed on the gravel fill and each will have a perimeter concrete ring wall. If the tanks are 23 feet tall, the imposed load on the gravel from the weight of diesel will be 1200 psf. The perimeter dike is 24 inches taller than the gravel fill and will be supported by vertical posts.

The measured compression ratios, $Cc/(1+e_0)$, of the two silt samples are 0.11 and 0.12. The measured compression values might be conservative since both of the samples were from shallow depths where the silt has probably been loosened by annual frost action. However, using a value of 0.12, the 1200-psf tank load would result in about 3.5 inches of settlement for the 8-foot thick silt layer. Reducing the height of the tank to 18 feet still results in a total settlement of about 3 inches.

The calculation assumes that the surface of the silt is 4 feet below the tank load. Where the silt is not present, the total compression of the sand from the tank load would be less than 1 inch. These settlement numbers are for the center of the tank, and settlements at the edge of the tank would be about half of these values.

The settlements would occur the first time the tanks are filled, and even if the tanks and piping could tolerate this amount of movement, the underlying membrane could be damaged at the edge of the tank. Several options are possible for reducing the settlement of the tanks. Driven piles could be designed to support the tanks and containment system. However, the cost of a structural system is expected to be more than supporting the tanks on fill. The silt could be partially or totally removed and replaced with a properly compacted sand fill. At least 4 feet of silt (a total excavation to 5 feet below existing grade) would have to be removed and replaced with sand fill to reduce the settlements to less than 1

TO: Dan Reynolds 273-1831

inch for the 18-foot tall tanks. A variation is to reuse the silt as fill. If the silt was excavated, placed in lifts and each lift properly compacted the potential settlements could be greatly reduced. However, the silt would have to be dried and that is only possible if the weather was not rainy. The fourth option is to place a surcharge load of extra fill on the pad to force the compression of the silt. A 5-foot thick sand surcharge would preload the silt and, in a relatively short period, cause the silt to compress so that the tank loads will result in settlements of less than 1 inch.

Local sand has been used for fill, but the source appears to be limited. Borrowing sand from below the water table requires stockpiling and drainage before the material is usable. Consequently, the sand and gravel fill will probably have to be imported by barge. Consequently, the surcharge option appears to be the most economical choice. The surcharge can be placed over a part of the site, and with settlement markers, the settlement can be monitored. When the settlement is complete, the surcharge can be moved onto the next section of the fuel tank area. When surcharging of the tank area has been completed, the extra sand can be used to fill the perimeter of the site outside the area of the tank loadings. We estimate that the surcharge will have to be on each location about 5 to 10 days, but this should be verified using settlement markers and periodic level surveys.

Differential settlements could be further reduced by placing a biaxial reinforcing geogrid at the middle of the sand fill. The sand fill would redistribute the tank stresses if the fill layer is mechanically stabilized with a geogrid such as Tensar BX 1200.

Recommendations

The ground in the area where the fill will be placed should be unfrozen before new fill is placed. The brush should be cleared, and the surface organics and root mat should be stripped and properly removed from the site. If done early in the season, removal of the organics will accelerate the thaw of seasonal frost. When the silt and sand exposed by the stripping has full thawed, it should be compacted as much as possible. But if the material starts to "pump" under the equipment loads, the compactive effort should be stopped and the first lift of

sand should be placed. A layer of engineering fabric should be placed on the subgrade prior to the placement of the sand fill. The fabric should be Mirafi 500 or equivalent. The fabric should be properly seamed or overlapped a horizontal distance of at least three feet.

If the fill is a uniformly graded sand, it should contain 15% or less material finer than the #200 sieve size. If the fill is a mixture of sand and gravel, it should contain 6% or less material finer than the #200 sieve size. The fill should be placed and compacted when it is unfrozen. The material should be placed in level lifts that are no thicker than 12 inches and each lift should be compacted with a roller to 95 percent of the material's maximum density as determined by the ASTM D-1557 test procedure. A smooth nonvibratory roller is reported to be the most successful with the fine sand fills in Bethel. If a geogrid is used in the fill, it should be placed midway in the layer of sand fill.

The surcharge should be applied before the membrane is installed. The surcharge fill should be constructed to a height of 5 feet above finish grade (6 feet above the level of the sand fill or a total fill height of 8 feet) and left temporarily in the tank area. The surcharge does not have to be compacted except by track-walking. After the surcharge is removed, the surface of the fill should be proof-rolled with the roller before placement of the membrane, protective geotextile, and overlying gravel fill.

The most positive way to determine if the settlement is complete under the surcharge load is to monitor the settlement. The total settlement can be determined using two settlement markers under each area that is surcharged. The markers should be placed at the third points of the surcharged area. The settlement markers can be constructed using four-foot square pieces of 3/4-inch plywood placed on the engineering fabric prior to placement of fill. A two-inch floor flange should be fastened to the center of the square and be used to fasten a vertical piece of two-inch iron pipe to the plywood. The pipe should extend above the level of the fill and surcharge. (Assuming 1 foot of overexcavation, a finish grade 3 feet above existing, and a surcharge of 5 feet, the pipe should be 10 feet long.) Fill placement around the pipe needs to be done carefully so that the pipes are not destroyed. After the surcharge is removed, the pipe can be unscrewed and removed and the plywood left in place.

The initial elevation of the plywood should be determined by a level survey referenced to a benchmark away from the work area. Any time a level survey is made, the depth to the plywood (or height of the pipe) can be verified by taping inside the two-inch pipe. Daily level surveys while the fill is being placed and afterwards will show the total settlement and the rate of settlement compared to the initial elevation. This data will be used to decide when the surcharge can be moved to a new location.

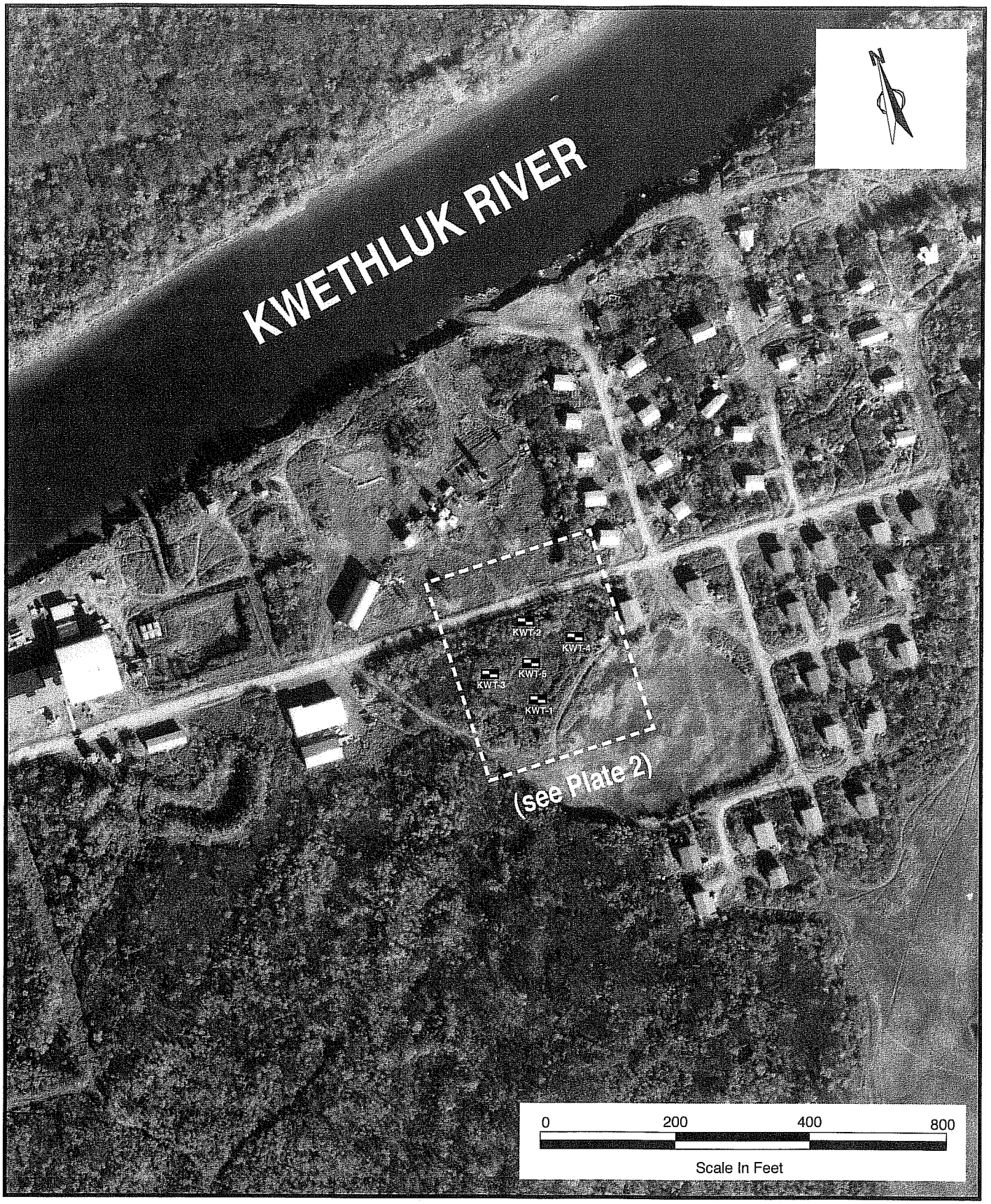
The perimeter containment dike should be designed to resist the earth pressure from the 1-foot of gravel fill and the fluid pressure inside the dike. The gravel will exert an equivalent fluid pressure of 35xH psf, where H is the depth in feet. Assuming a 3-foot depth of diesel above the membrane, the total load is about 250 pounds per foot of wall. The timber posts that support the dike will resist these loads by passive pressure from the sand fill outside the containment dike. The fill will be 40 inches wide outside the posts and then will slope down at 2 horizontal to 1 vertical. With this geometry, the passive pressure can be calculated using an equivalent fluid pressure of 180xH psf where H is the depth below ground surface on the outside of the dike. This value has a factor of safety of two to limit the ground movements. The passive pressure is applied to an area equal to 3 times the width of the post. The bottom 1 foot of the post should be ignored when calculating the resisting force. Therefore, if the post is 12 inches wide and embedded to a depth of 4 feet, the allowable resisting force would be 2430 pounds per post ($P = 1/2 \times 200 \times 3^2 \times 3 \times 12''/12''$).

The plans and specifications should be reviewed by us to verify that they are in accordance with the intent of these recommendations. The overexcavation of soil and placement and compaction of new fill should be inspected and tested by an experienced engineer. The settlement data should be reviewed by us each week. Inspection will permit the detection of unanticipated conditions and allow verification that the work is done in accordance with the intent of the recommendations in this report.

Very truly yours,

Duane L. Miller, P.E.

Attachments:
Plate 1, Vicinity Map
Plate 2, Test Pit Locations
Plates 3 through 5, Test Pit Logs
Plate 6, Soil Classification Chart
Plate 7, Summary of Samples
Plate 8, Particle Size Data
Plates 9 and 10, Consolidation Test Data
Plate 11, Harvard Compaction Test
Plate 12, Photographs



NOTES: 1. Adapted from aerial photograph dated 10/01/97 © Aeromap U.S.
2. Test pit locations are approximate

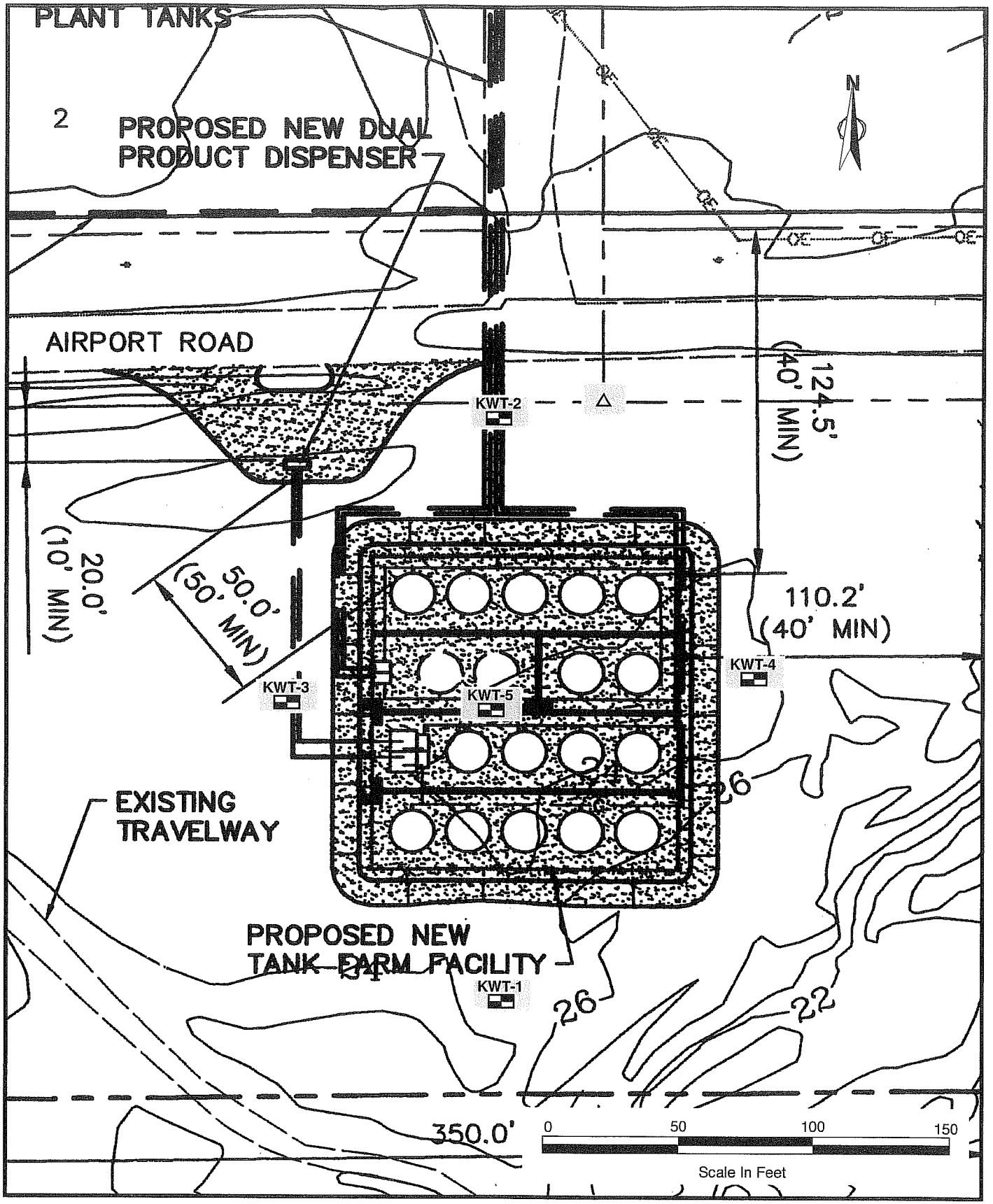
TEST PIT LOCATION

Duane Miller & Associates
Job No.: 4084.036
Date: January 2005

VICINITY MAP

Bulk Fuel Tank Farm
Kwethluk, Alaska

Plate
1



NOTES: 1. Adapted from site map provided by CRW
2. Test pit locations are based on cloth tape distances from survey monument

TEST PIT LOCATION
△ SURVEY MONUMENT

Duane Miller & Associates
Job No.: 4084.036
Date: January 2005

TEST PIT LOCATIONS
Bulk Fuel Tank Farm
Kwethluk, Alaska

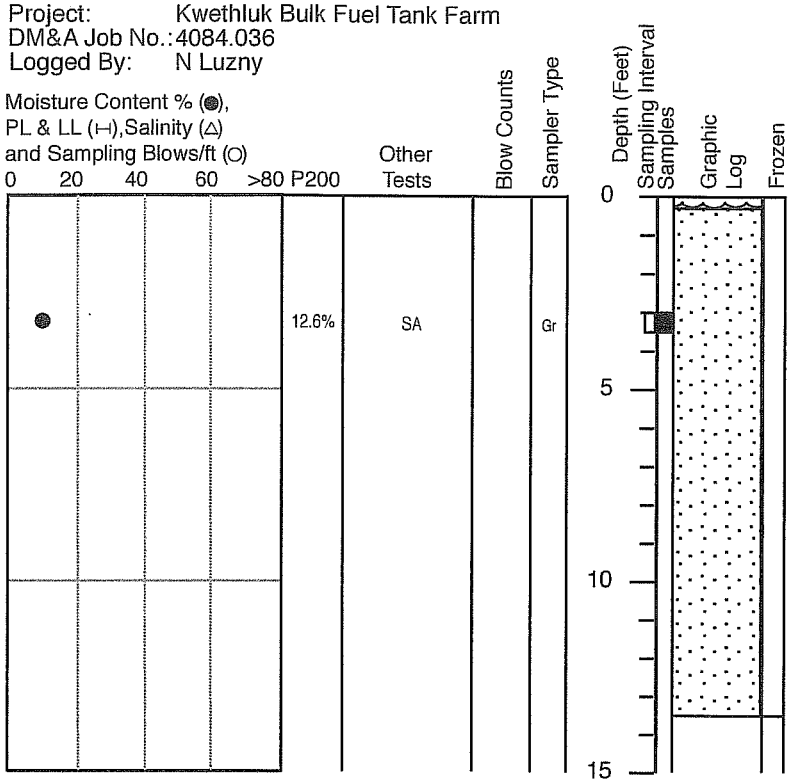
Plate
2

DUANE MILLER & ASSOCIATES

Project: Kwethluk Bulk Fuel Tank Farm
DM&A Job No.: 4084.036
Logged By: N Luzny

Log of HOLE: KWT-1

Date Drilled: 11/16/04
Contractor.: KTRC Inc
Equipment: Komatsu PC200
GPS Coord.: N 60°48'39.8" W 161°24'58.4"
Elevation: 25 *



Description

PEAT (Pt) Organic mat, willow roots and overburden

SAND (SP) Brown, moist, becoming grayer w/ depth, uniform, fine grained w/ interlayers of silty sand (SM)

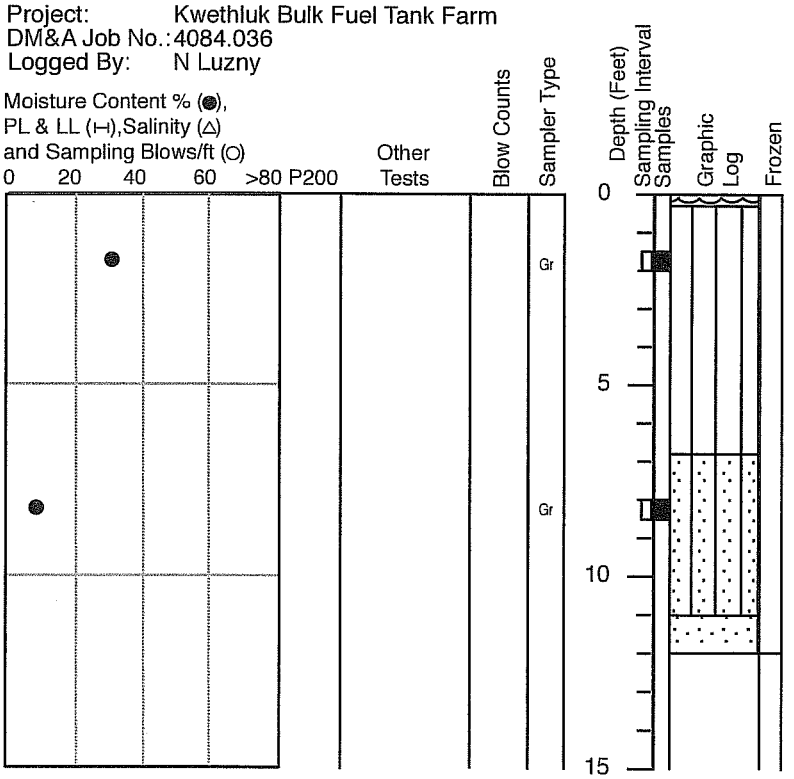
wet at 12'

DUANE MILLER & ASSOCIATES

Project: Kwethluk Bulk Fuel Tank Farm
DM&A Job No.: 4084.036
Logged By: N Luzny

Log of HOLE: KWT-2

Date Drilled: 11/17/04
Contractor.: KTRC Inc
Equipment: Komatsu PC200
GPS Coord.: N 60°48'39.8" W 161°24'58.4"
Elevation: 25 *



Description

PEAT (Pt) Organic mat, willow roots and overburden

SILT (ML) Brown, moist, some organics near (Pt) contact, becoming grayer w/ depth

SILTY SAND (SP) Gray, moist, fine grained, becoming grayer w/ depth

SAND (SP) Gray, moist, uniform, fine grained caving in at 12'

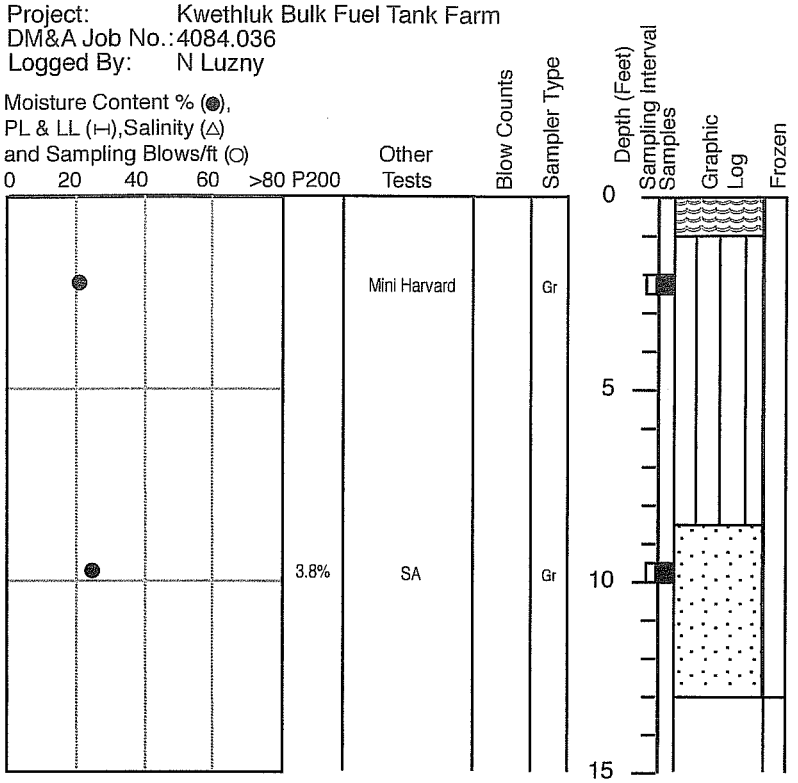
* Elevations interpolated from contours on topographic map provided by CRW

DUANE MILLER & ASSOCIATES

Project: Kwethluk Bulk Fuel Tank Farm
DM&A Job No.: 4084.036
Logged By: N Luzny

Log of HOLE: KWT-3

Date Drilled: 11/17/04
Contractor.: KTRC Inc
Equipment: Komatsu PC200
GPS Coord.: N 60°48'39.8" W 161°24'58.4"
Elevation: 25 *



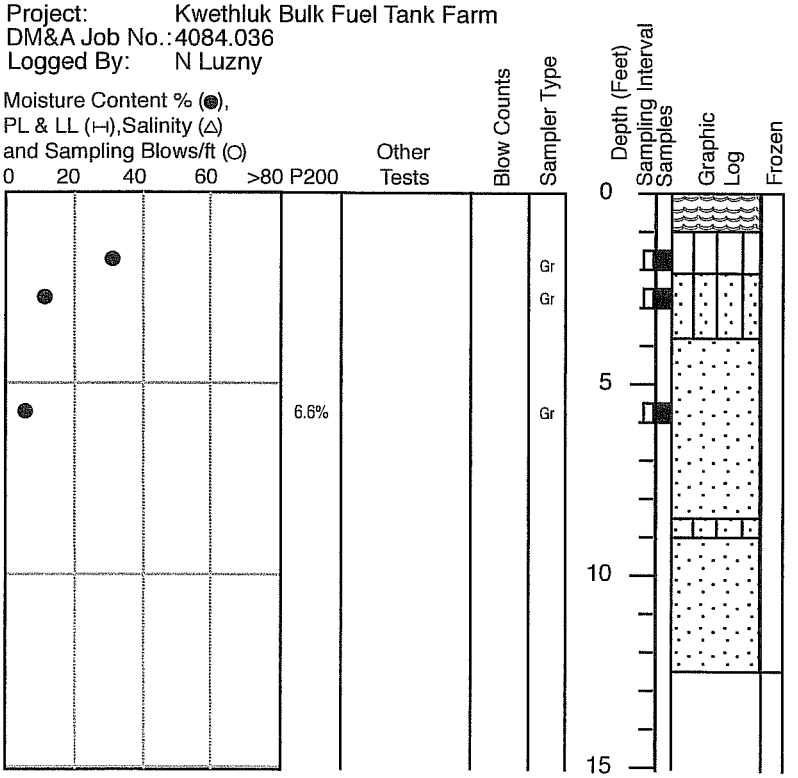
Description
ORGANIC MAT (Pt) Organic mat, willow roots and overburden
SILT (ML) Brown, moist, some organics near (Pt) contact, becoming grayer w/ depth
Increased sand at 6.0'
SAND (SP) Gray, uniform, fine grained

DUANE MILLER & ASSOCIATES

Project: Kwethluk Bulk Fuel Tank Farm
DM&A Job No.: 4084.036
Logged By: N Luzny

Log of HOLE: KWT-4

Date Drilled: 11/17/04
Contractor.: KTRC Inc
Equipment: Komatsu PC200
GPS Coord.: N 60°48'39.8" W 161°24'58.4"
Elevation: 25 *



Description
ORGANIC MAT (Pt) Organic mat, willow roots and overburden
SILT (ML) Brown, moist, some organics near Pt contact, becoming grayer w/ depth
SILTY SAND (SM) Gray, moist, fine grained
SAND (SP-SM) Gray, uniform, fine grained, becoming grayer w/ depth
SILTY SAND (SP) Gray, moist, fine grained
SAND (SP) Gray, uniform, fine grained

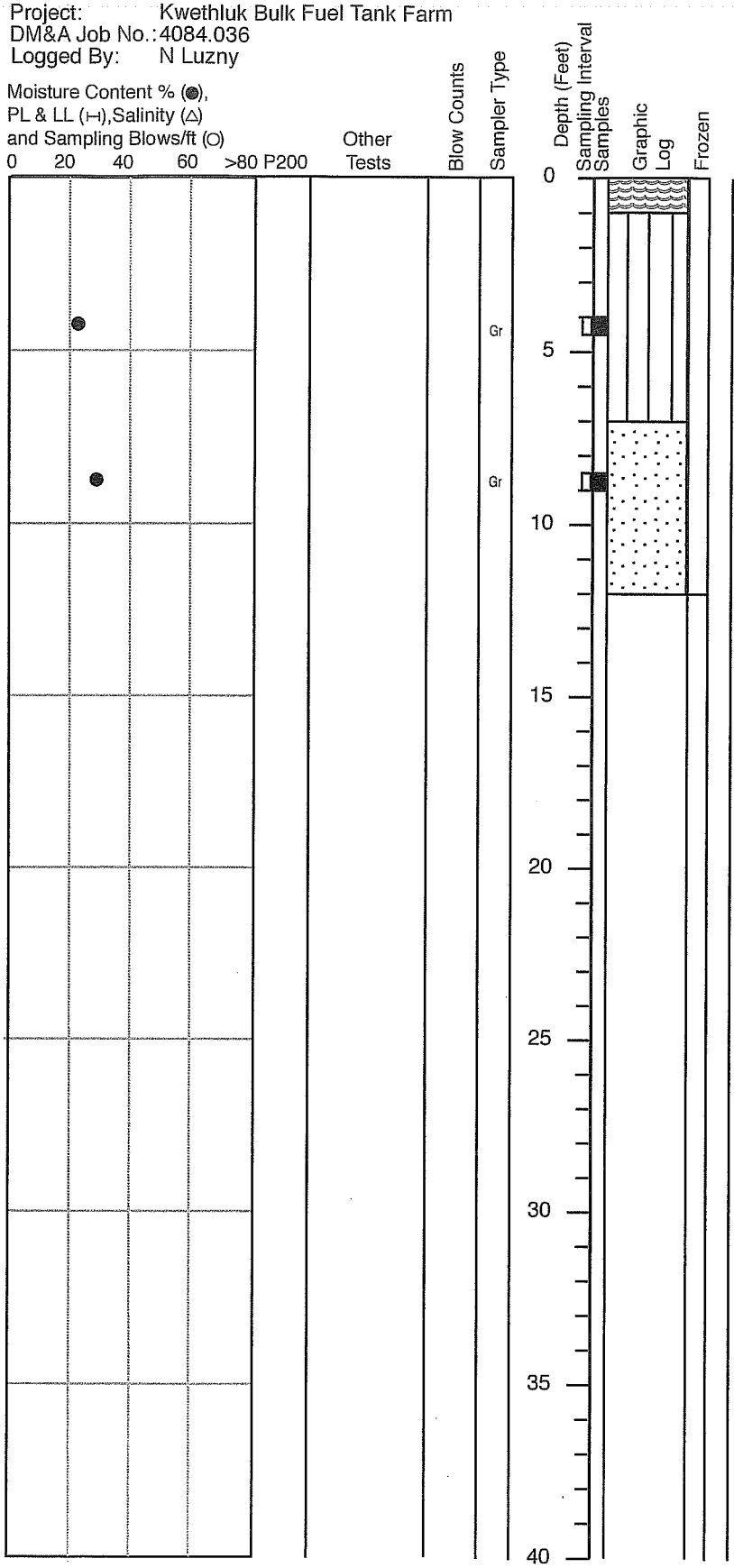
* Elevations interpolated from contours on topographic map provided by CRW

DUANE MILLER & ASSOCIATES

Project: Kwethluk Bulk Fuel Tank Farm
DM&A Job No.: 4084.036
Logged By: N Luzny

Log of HOLE: KWT-5

Date Drilled: 11/17/04
Contractor.: KTRC Inc
Equipment: Komatsu PC200
GPS Coord.: N 60°48'39.8" W 161°24'58.4"
Elevation: 25 *



Description

ORGANIC MAT (Pt) Organic mat, willow roots and overburden

SILT (ML) Brown, moist, some organics near (Pt) contact, becoming grayer w/ depth

SAND (SP) Gray, uniform, fine grained, becoming grayer w/ depth

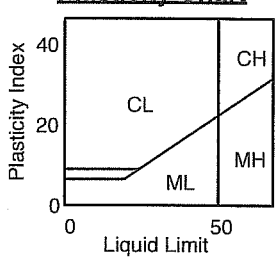
* Elevations interpolated from contours on topographic map provided by CRW

Duane Miller & Associates
Job No.: 4084.036
Date: January 2005

LOG of TEST PIT KWT-5
Bulk Fuel Tank Farm
Kwethluk, Alaska

Plate
5

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS (50% or more larger than #200 sieve, 0.075 mm)	GRAVELS — More than half of the coarse fraction is larger than #4 sieve size, > 4.75 mm.	Clean gravels with little or no fines	GW	Well graded gravels, sandy gravel
			GP	Poorly graded gravels, sandy gravel
		Gravels with more than 12% fines	GM	Silty gravels, silt sand gravel mixtures
			GC	Clayey gravels, clay sand gravel mixtures
	SANDS — More than half of the coarse fraction is smaller than #4 sieve size, < 4.75 mm.	Clean sands with little or no fines	SW	Well graded sand, gravelly sand
			SP	Poorly graded sands, gravelly sand
		Sands with more than 12% fines	SM	Silty sand, silt gravel sand mixtures
			SC	Clayey sand, clay gravel sand mixtures
FINE GRAINED SOILS (> 50% finer than #200 sieve)	SILTS and CLAYS — Plasticity Chart	Liquid limit less than 50	ML	Inorganic silt and very fine sand, rock flour
			CL	Inorganic clay, gravelly and sandy clay, silty clay
			OL	Organic silts and clay of low plasticity
		Liquid limit greater than 50	MH	Inorganic silt
			CH	Inorganic clay, fat clay
			OH	Organic silt and clay of high plasticity
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soil



UNIFIED SOIL CLASSIFICATION SYSTEM

KEY TO TEST DATA

PP = Pocket Penetrometer
Dd = Dry Density (pcf)
LL = Liquid Limit
PL = Plastic Limit
PI = Plastic Index
NP = non Plastic
SpG = Specific Gravity
SA = Sieve Analysis
MA = Sieve and Hydrometer Analysis
OLI = Organic Loss
RD = Relative Density
D1557 = modified Proctor
TS = Thaw Consolidation
Con = Consolidation
TXUU = Unconsolidated Undrained Triaxial
TXCU = Consolidated Undrained Triaxial
TXCD = Consolidated Drained Triaxial

Strength Data
XXX(YYY), where
XXX = $(\sigma_1-\sigma_3)/2$
YYY = σ_3

KEY TO SAMPLE TYPE

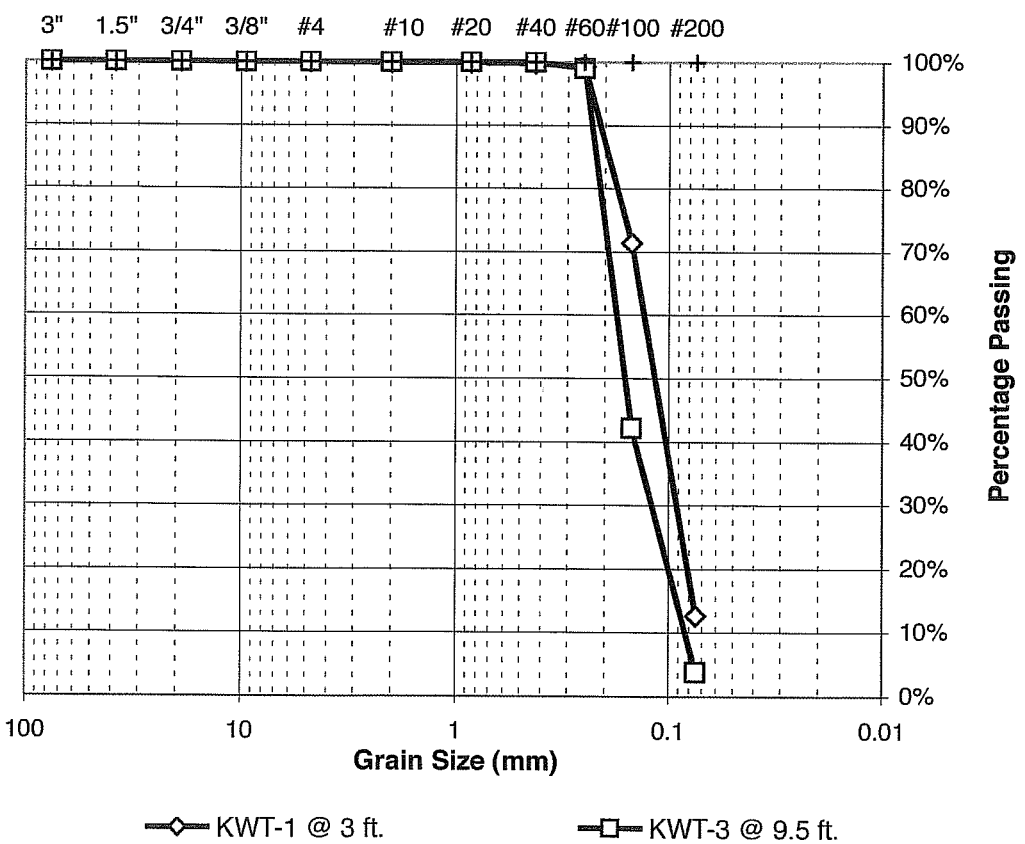
gr = Grab sample
Ab = Auger bulk
Ac = Air chip
Sh = 2.5" ID split barrel w/ 340 lb. manual hammer
Sh* = 2.5" ID split barrel w/ 140 lb. manual hammer
Sha= 2.5" ID split barrel w/ 340 lb. automatic hammer
Tw = Shelby tube
Ss = 1.4" ID split barrel w/ 140 lb. manual hammer
Cc = 3.25" continuous core barrel

GROUP	ICE VISIBILITY	DESCRIPTION		SYMBOL	
N	Segregated ice not visible by eye	Poorly bonded or friable		Nf	
		Well bonded	No excess ice	Nb	Nbn
			Excess microscopic ice		Nbe
V	Segregated ice is visible by eye and is one inch or less in thickness	Individual ice crystals or inclusions		Vx	
		Ice coatings on particles		Vc	
		Random or irregularly oriented ice		Vr	
		Stratified or distinctly oriented ice		Vs	
		Uniformly distributed ice		Vu	
ICE	Ice greater than one inch in thickness	Ice with soil inclusions		ICE + soil type	
		Ice without soil inclusions		ICE	

ICE CLASSIFICATION SYSTEM

Test Hole	Sample Depth	Soil Type (USCS)	Thermal State	Sampler Type	Moisture Content	Dry Density	Passing #200	Other Tests
KWT-1	3.0 ft.	SM	Unfrozen	Gr	10.4%		12.6%	SA
KWT-2	1.5 ft.	ML	Unfrozen	Gr	30.9%			
KWT-2	8.0 ft.	SP	Unfrozen	Gr	9.2%			
KWT-3	2.0 ft.	ML	Unfrozen	Gr	21.4%			Mini Harvard
KWT-3	9.5 ft.	SP	Unfrozen	Gr	25.2%		3.8%	SA
KWT-4	1.5 ft.	ML	Unfrozen	Gr	31.4%			
KWT-4	2.5 ft.	SP	Unfrozen	Gr	11.7%			
KWT-4	5.5 ft.	SP-SM	Unfrozen	Gr	6.2%		6.6%	
KWT-5	4.0 ft.	ML	Unfrozen	Gr	23.1%			
KWT-5	8.5 ft.	SP	Unfrozen	Gr	29.2%			
KWT-JS	1.0 ft.	ML	Unfrozen	Tube	33.0%	72 pcf		Consol
KWT-JS	1.5 ft.	ML	Unfrozen	Tube	30.8%	75 pcf		Consol

Boring =>	KWT-1	KWT-3
Depth =>	3.0 ft.	9.5 ft.
3" =>	100.0%	100.0%
1 1/2" =>	100.0%	100.0%
3/4" =>	100.0%	100.0%
3/8" =>	100.0%	100.0%
#4 =>	100.0%	100.0%
#10 =>	99.9%	100.0%
#20 =>	99.9%	100.0%
#40 =>	99.8%	100.0%
#60 =>	99.3%	99.0%
#100 =>	71.4%	42.1%
#200 =>	12.6%	3.8%
Analysis of Data		
D10 size =>		0.084 mm
D30 size =>	0.092 mm	0.120 mm
D50 size =>	0.117 mm	0.161 mm
D60 size =>	0.131 mm	0.176 mm
Coeff. of Uniformity, Cu =		2.10
Coeff. of Curvature, Cc =		0.98
Gravel (+#4) percentage =	0%	0%
Sand percentage =	87.3%	96.2%
Fines percentage =	12.6%	3.8%
Unified Soil Class Symbol =	**SM**	**SP**



Duane Miller & Associates
Job No. 4084.036
January 2005

PARTICLE SIZE DATA

Bulk Fuel Tank Farm
Kwethluk, Alaska

Plate
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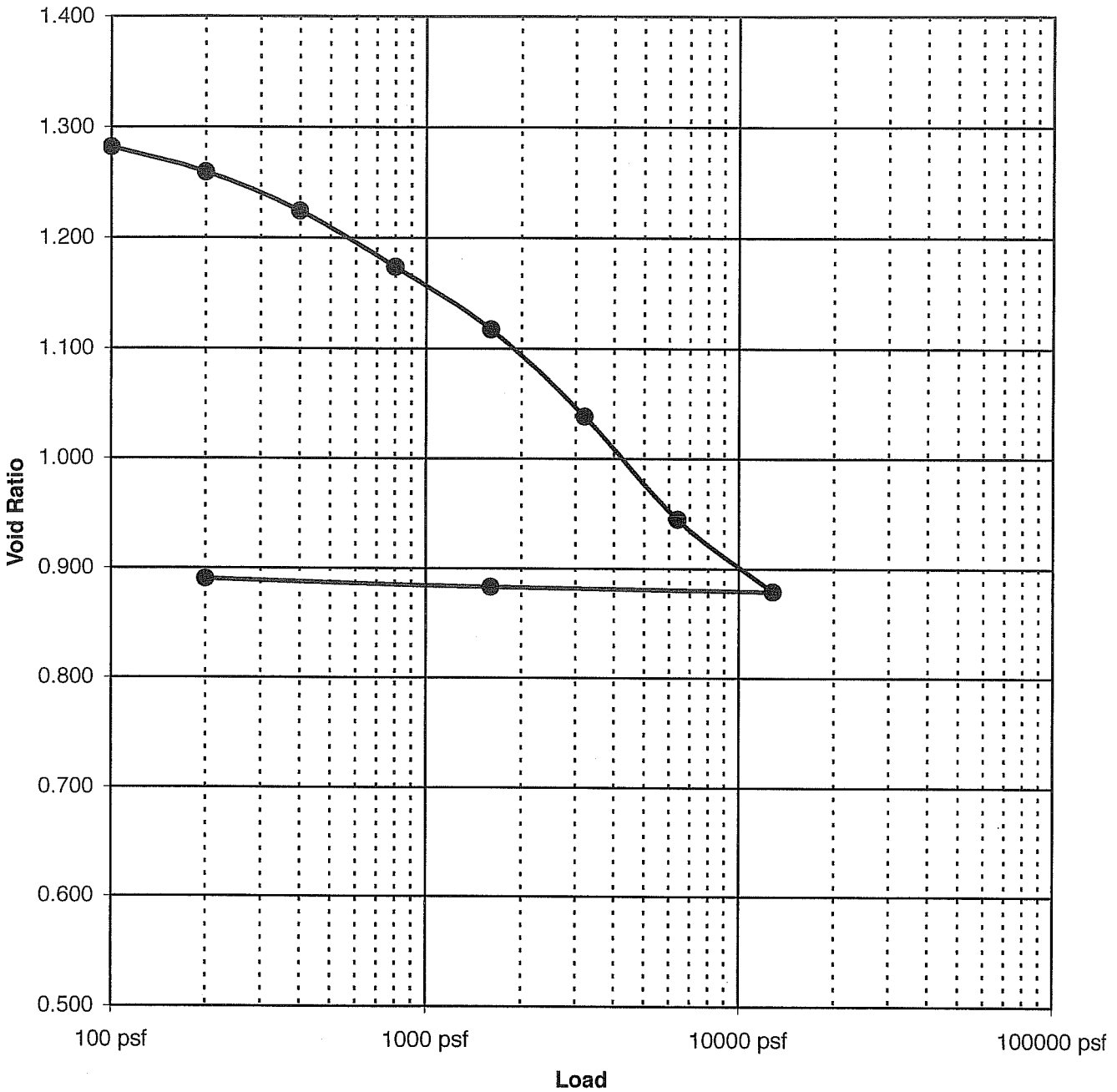

			Before Test	End of Test		
Boring =					Initial Void Ratio, eo =	1.410
Sample Depth =	1.0 ft	Dry Density =	67 pcf	68 pcf	Compression Index, Cc =	0.26
Assumed SpG =	2.6	Moisture Content =	22.9%	35.2%	Recompression Index, Cr =	0.01
Initial Height =	0.80 in	Saturation =	42%	66%	Preconsolidation Pressure, Pp =	
Soil Description =	Light brown SILT (ML) w/ roots, crumbly w/ fine sand				Overburden Pressure, Po =	80 psf

Duane Miller & Associates
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January 2005

CONSOLIDATION TEST
Bulk Fuel Tank Farm
Kwethluk, Alaska

Plate
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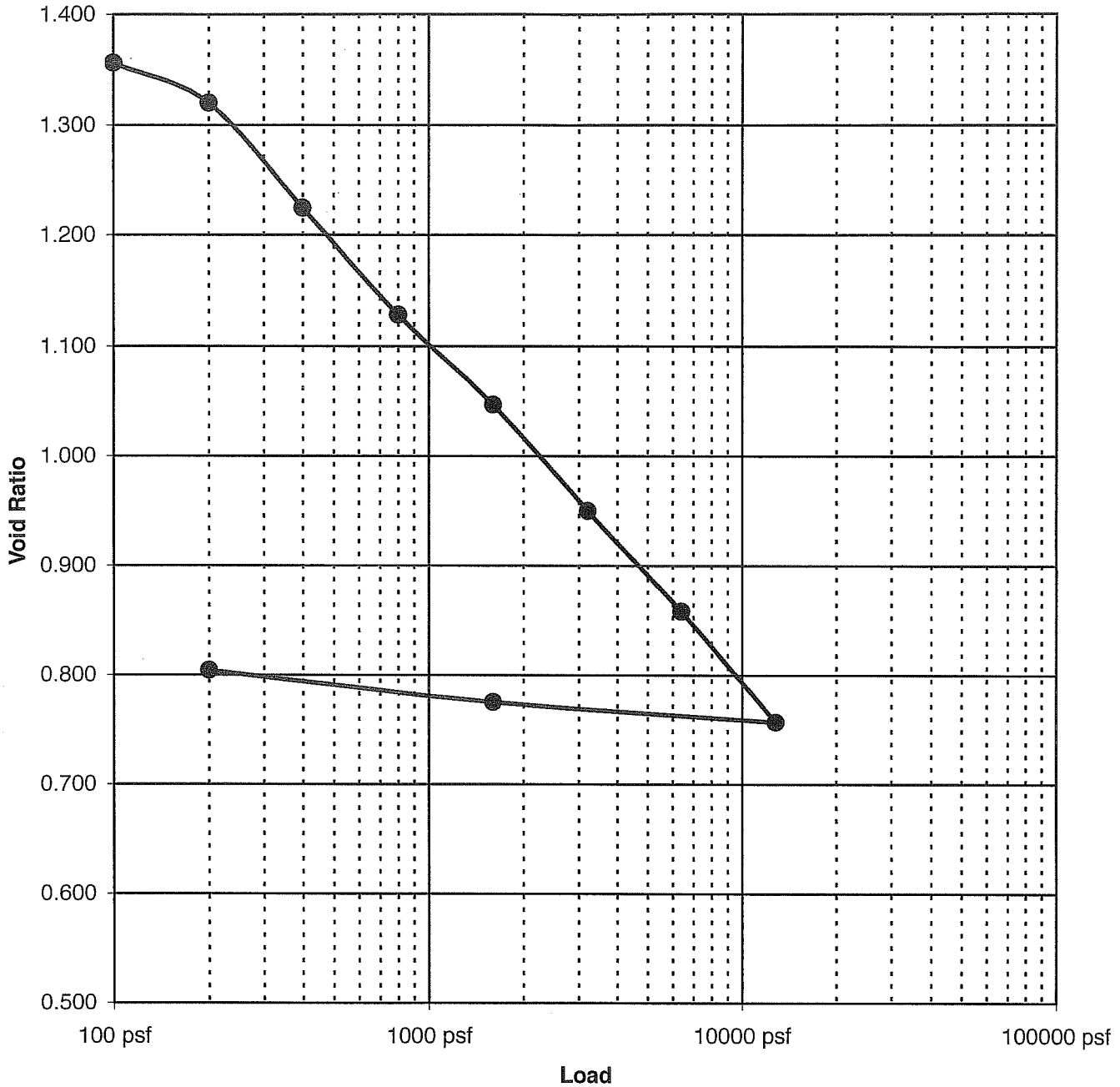


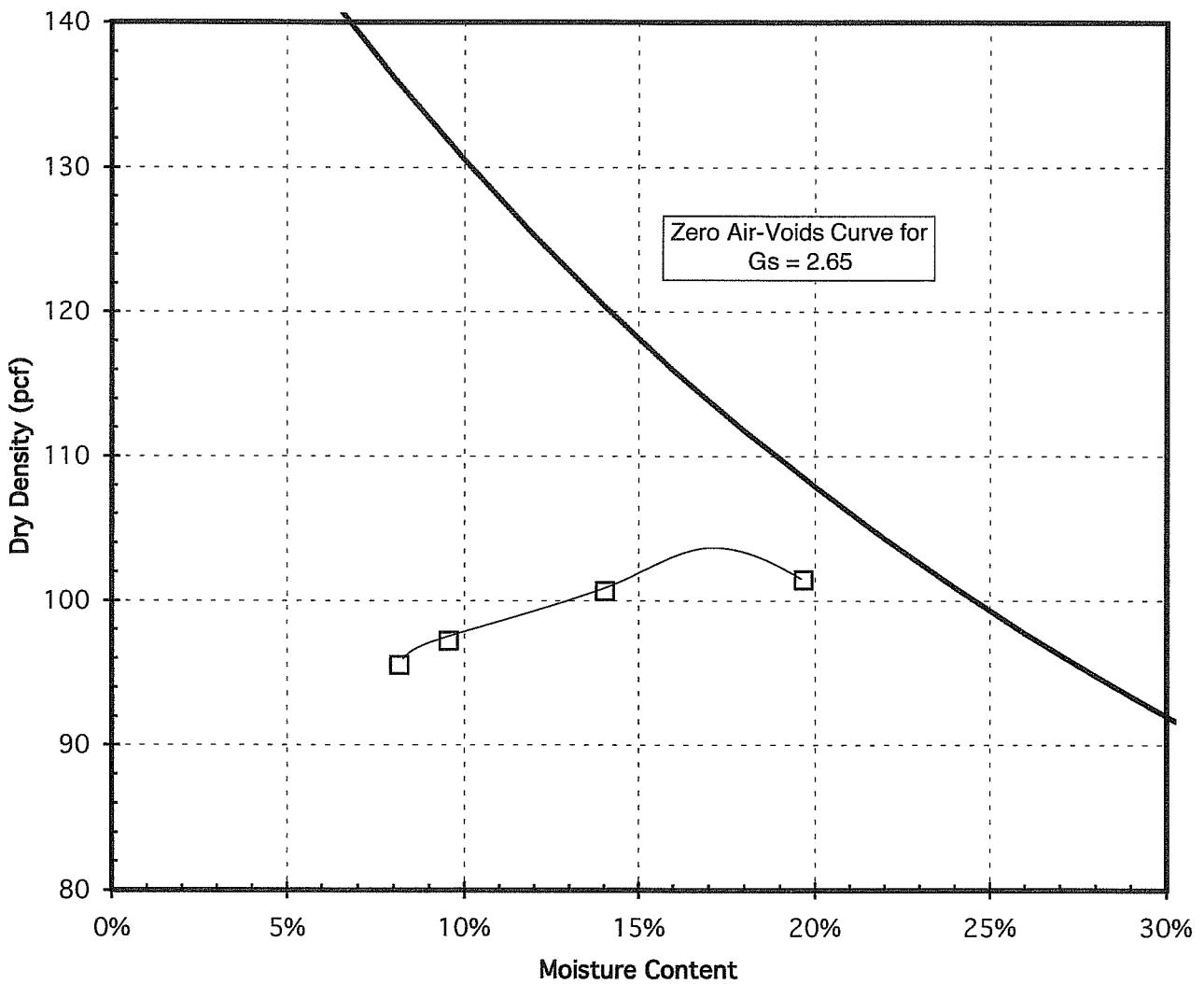
			Before Test	End of Test		
Boring =	KWT-JS				Initial Void Ratio, eo =	1.583
Sample Depth =	1.5 ft	Dry Density =	63 pcf	90 pcf	Compression Index, Cc =	0.32
Assumed SpG =	2.6	Moisture Content =	26.6%	30.8%	Recompression Index, Cr =	0.03
Initial Height =	0.80 in	Saturation =	44%	100%	Preconsolidation Pressure, Pp =	
Soil Description =	Light brown SILT (ML) w/ roots, crumbly w/ fine sand				Overburden Pressure, Po =	80 psf

Duane Miller & Associates
Job No. 4084.036
January 2005

CONCOLIDATION TEST
Bulk Fuel Tank Farm
Kwethluk, Alaska

Plate
10

Symbol =	□
Sample Source =	KWT-3 @2.0 ft.
Sample Description =	Silt (ML)
Test Method =	Harvard Mini
Maximum Density =	102 pcf
Optimum Moisture Content =	17%



Duane Miller & Associates
Job No. 4084.036
January 2005

COMPACTION TEST DATA

Bulk Fuel Tank Farm
Kwethluk, Alaska

Plate
11

PHOTO 1. Proposed bulk fuel tank farm site looking south.

PHOTO 2. Proposed bulk fuel tank farm looking north with old river terrace in the foreground.

APPENDIX D

U.S. ARMY CORPS OF ENGINEERS
FLOOD HAZARD DATA

Kwethluk | City Office: (907) 757-6022 | Revised:

STATUS	2nd class city	LAST FLOOD EVENT	1989
POPULATION	698	FLOOD CAUSE	
BUILDINGS		ELEVATION	
RIVER SYSTEM	Kuskokwim River	FLOOD OF RECORD	
COASTAL AREA	none	FLOOD CAUSE	
		ELEVATION	
NFIP STATUS	not participating	WORST FLOOD EVENT	
FLOODPLAIN REPORT	yes	FLOOD CAUSE	
FLOOD INSURANCE STUDY	no	FLOOD GAUGE	yes

Comments:

Flood of record	26.55
Recommended building elevation	28.55

Four High Water Marks (HWM) where placed at the level of the 1989 flood. HWE #1 is on the piling on the shoreward, downstream corner of the school. HWE #2 is on the piling at the streamward, downstream corner of the school. HWE #3 is on the utility pole streamward of the downstream end of the school. HWE #4 is on the landward, upstream corner of the Ken Chadwick house. HWM's are not tied to a any benchmark. The 1972 flood may have been 2 ft higher than the 1989 flood. Flooding occurs from both Ice-jams and high runoff. Some flooding occurs annually but depths seldom exceed 3 to 4 ft.

Flood Gauge

Floodplain Manager (907) 753-2610

APPENDIX E

WIND POWER DENSITY MAPS

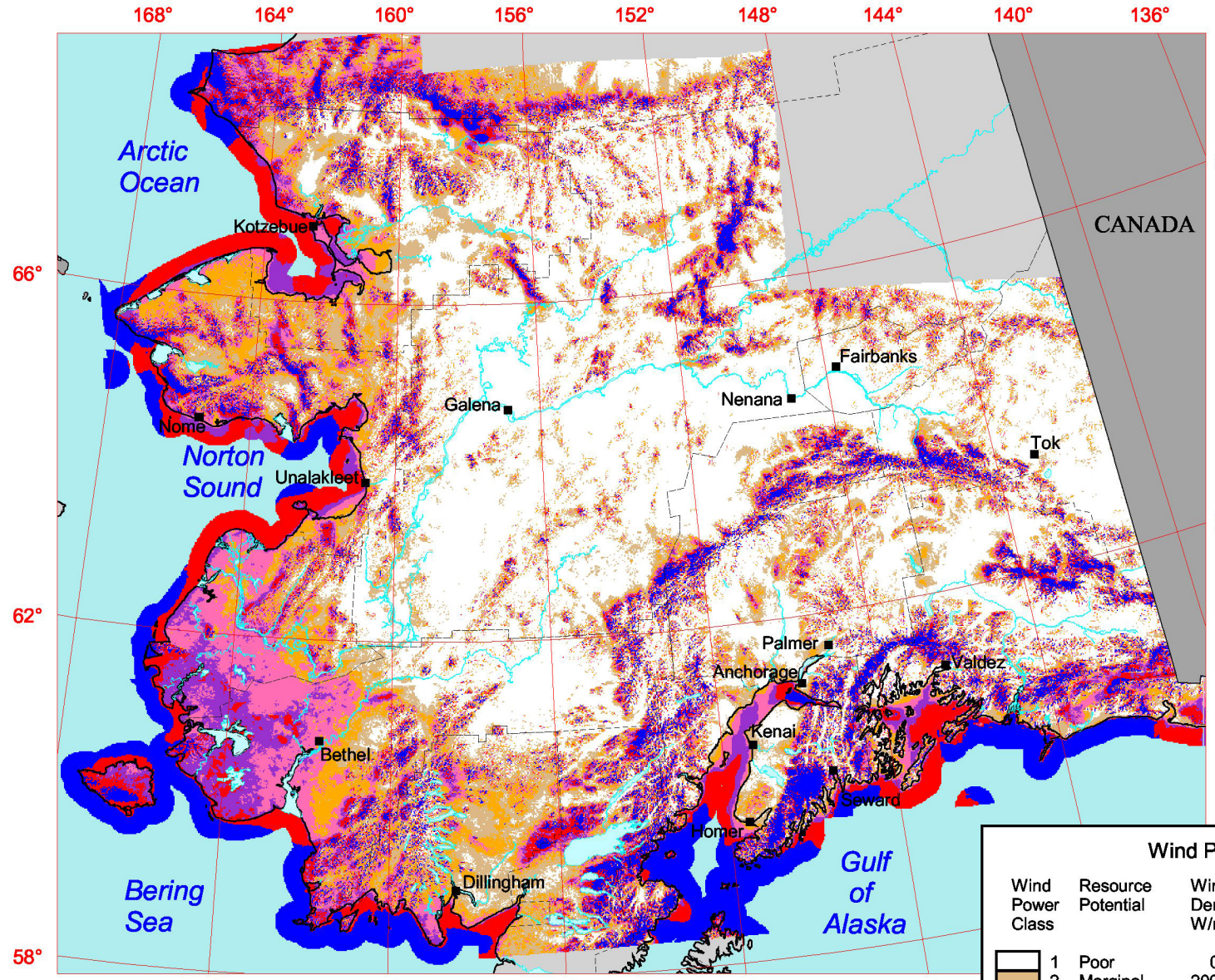
Wind Powering America: Alaska Wind Resource MapU.S. Department of Energy -
Energy Efficiency and Renewable Energy
Wind and Hydropower Technologies Program - Wind Powering America
Alaska Wind Resource Map

This map of Alaska shows the wind resource at 50 meters.

Viewing Options
Larger Jpeg: Click Map
Printable:(PDF 6.1 MB)
Download Adobe Reader

The Department of Energy's Wind Program and the National Renewable Energy Laboratory (NREL) published a new wind resource map for the state of Alaska. This resource map shows wind speed estimates at 50 meters above the ground and depicts the resource that could be used for utility-scale wind development. Future plans are to provide wind speed estimates at 30 meters, which are useful for identifying small wind turbine opportunities. As a renewable resource, wind is classified according to wind power classes, which are based on typical wind speeds. These classes range from Class 1 (the lowest) to Class 7 (the highest). In general, at 50 meters, wind power Class 4 or higher can be useful for generating wind power with large turbines. Class 4 and above are considered good resources. Particular locations in the Class 3 areas could have higher wind power class values at 80 meters than shown on the 50 meter map because of possible high wind shear. Given the advances in technology, a number of locations in the Class 3 areas may suitable for utility-scale wind development.
This map indicates that mainland Alaska has wind resources consistent with utility-scale production. The largest contiguous low elevation area of good-to-excellent resource is located in the western part of the state between Bethel and the Yukon River Delta. Coastal locations along the Bering Sea and the Arctic Ocean are likely to have good-to-excellent resource. Excellent wind resources are located on higher ridge crests crest locations throughout mainland Alaska including the Brooks and Alaska Ranges and the Chugach Mountains.

Note: Wind resource at a micro level can vary significantly; therefore, you should get a professional evaluation of your specific area of interest.



Alaska Mainland Regions 50 m Wind Power

The annual wind power estimates for this map were produced by AWS Truewind using their Mesomap system and historical weather data. It has been validated with available surface data by NREL and wind energy meteorological consultants.

Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed[a] at 50 m m/s	Wind Speed[a] at 50 m mph
1	Poor	0 - 200	0.0 - 5.3	0.0 - 11.9
2	Marginal	200 - 300	5.3 - 6.1	11.9 - 13.7
3	Fair	300 - 400	6.1 - 6.7	13.7 - 15.0
4	Good	400 - 500	6.7 - 7.3	15.0 - 16.4
5	Excellent	500 - 600	7.3 - 7.7	16.4 - 17.2
6	Outstanding	600 - 800	7.7 - 8.5	17.2 - 19.0
7	Superb	> 800	> 8.5	> 19.0

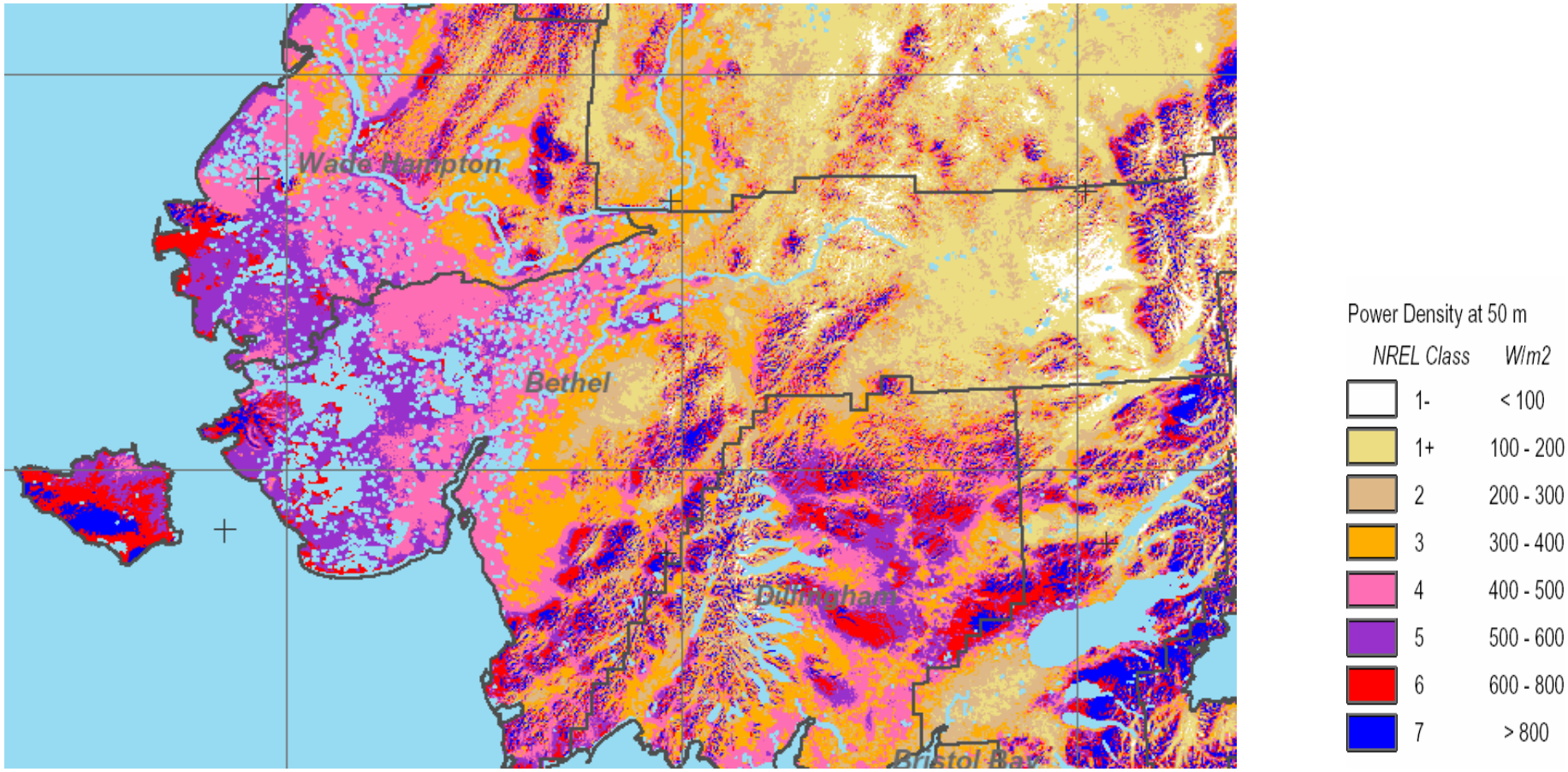
[a] Wind speeds are based on a Weibull k of 1.8. Weibull k values in Alaska vary from 1.4 to 2.0.

U.S. Department of Energy
National Renewable Energy Laboratory

100 0 100 200 300 400 Kilometers
50 0 50 100 150 200 250 Miles

18-JAN-2006 4.1.1

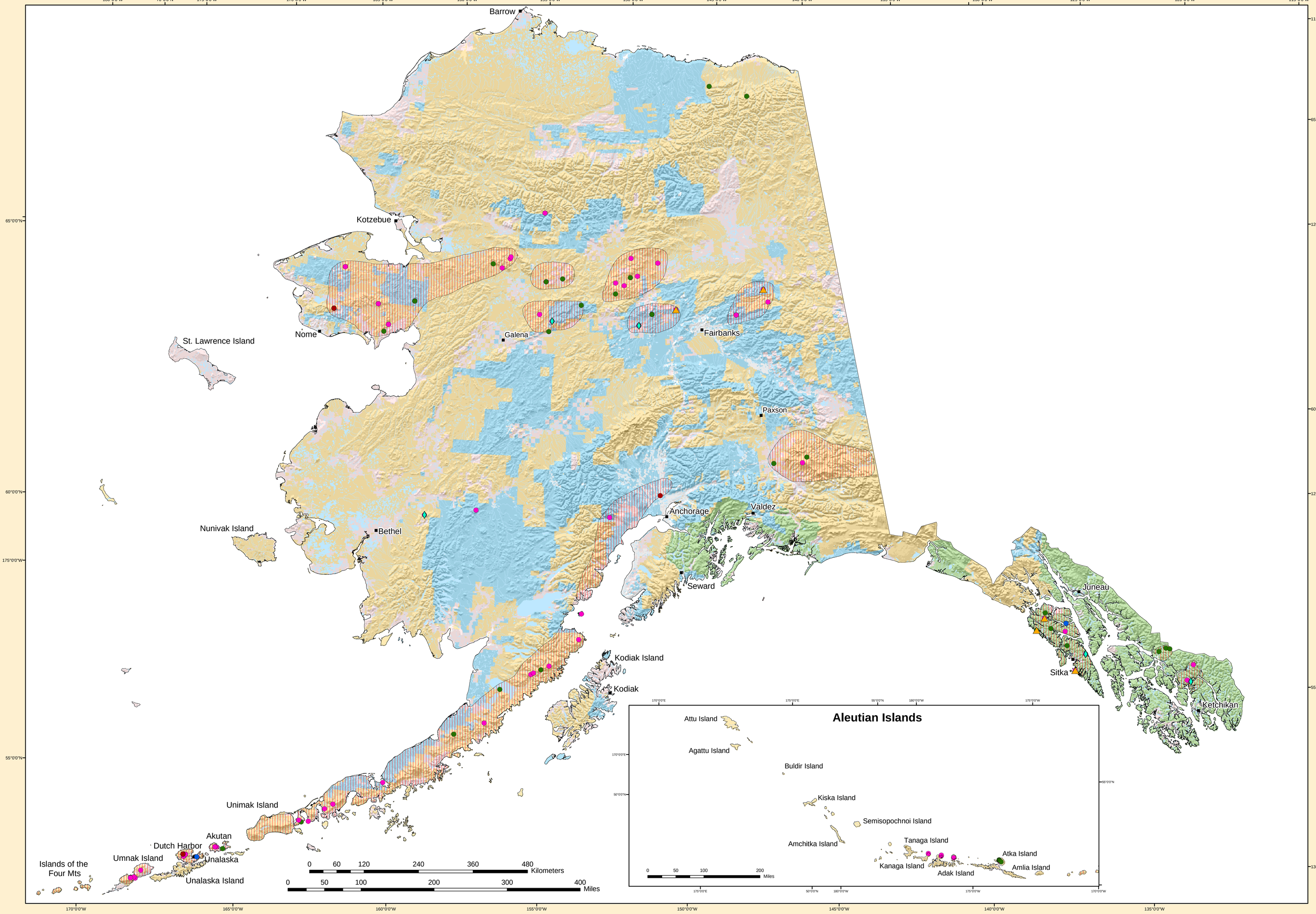
Wind Power Density Map



This map is an exert from the Wind Power Density Map of Alaska created by TrueWind Solutions.

Alaska Geothermal Resources
Publication No. - INEEL/MIS-2002-1623 Rev.1
November 2003

Alaska Geothermal Resources



Legend

- Cities/Towns
- Rivers/Streams
- Lakes/Reservoirs

Geothermal Categories

- Space Heating
- Spas/Resorts/Recreation Sites
- Regions of Known or Potential Geothermal Resources
- Wells > 50 Degrees C
- Springs > 50 Degrees C
- Wells ≥ 20 and ≤ 50 Degrees C
- Springs ≥ 20 and ≤ 50 Degrees C

Ownership

- Private Lands
- Bureau of Land Management and Other Federal Lands
- State Lands
- Native American Lands
- U.S. Forest Service Lands

Map prepared by Patrick Laney and Julie Brizzee at the Idaho National Engineering and Environmental Laboratory
for
The U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Geothermal Technologies Program

Geothermal Data Provided by:

1. Geo-Heat Center State Geothermal Database, [Compact Disk], February 2002
2. National Geophysical Data Center, National Oceanic and Atmospheric Administration, 1983, Geothermal Resources of Alaska: Prepared for the Geothermal and Hydropower Technologies Division United States Department of Energy, Map 1:2,500,000

Alaska Geothermal Resources
Publication No. - INEEL/MIS-2002-1623 Rev. 1
November 2003

Map Projection Information:
Projection: Albers
Central Meridian: -154.00
Standard Parallel 1: 55.00
Standard Parallel 2: 65.00
Latitude Of Origin: 50.00

APPENDIX F

PEAK LOAD TREND ANALYSIS AND PCE DATA

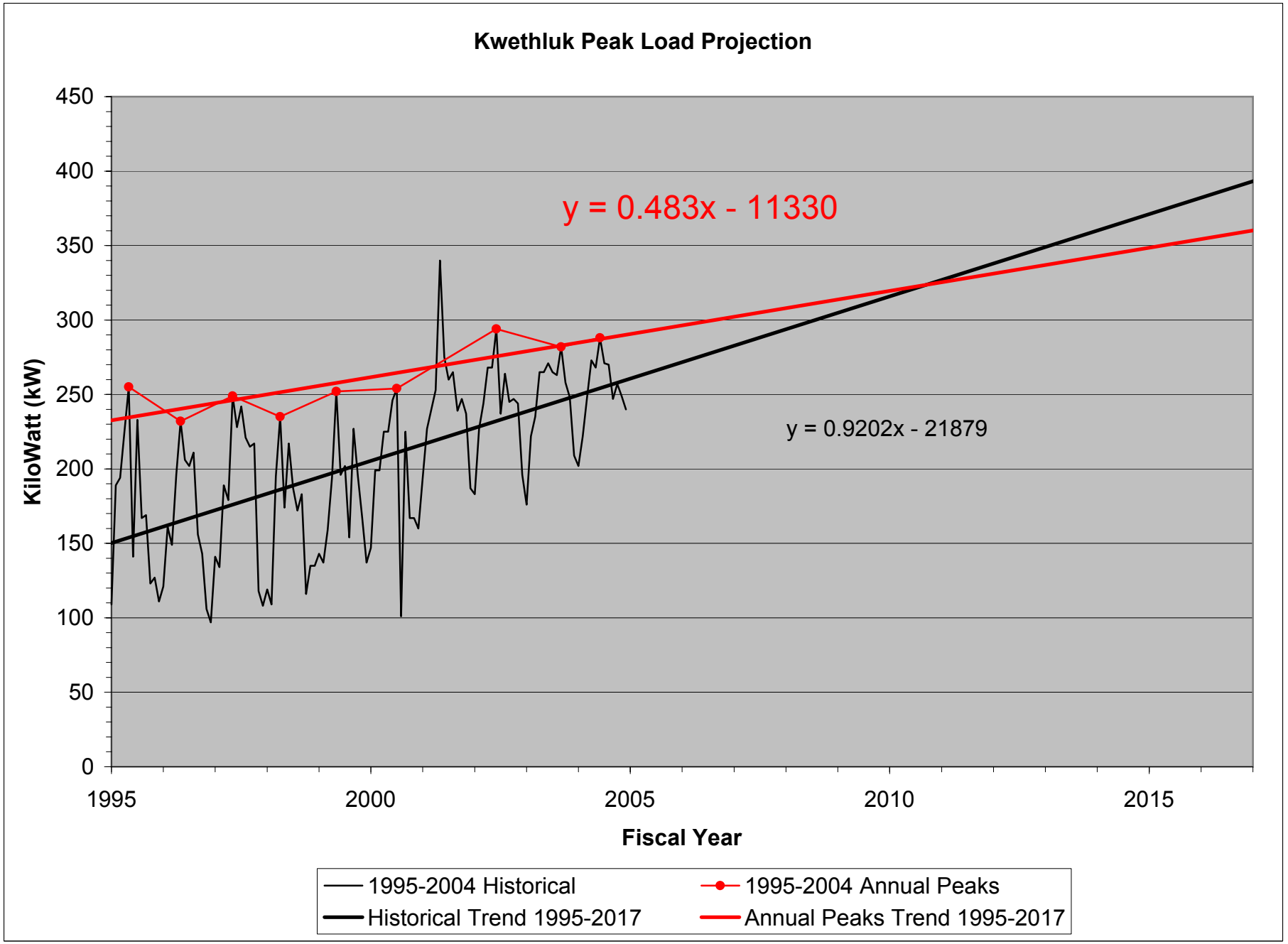
Kwethluk Electrical Demand Worksheet

Fiscal Year	Historical Electrical Consumption (kWh)	Historical Electrical Consumption % change	Historical Fuel Consumption (gallons)	Historical Fuel Consumption % change	Fuel Efficiency kW/gal	Historical Peak Load (kW)	Historical Peak Load % change	Historical Population	Historical Population % change	Calendar Year
1995	1,131,587	na	96,599	na	11.71	255	na	644	na	1995
1996	1,162,905	2.77	92,607	-4.13	12.56	232	-9.02	630	-2.17	1996
1997	1,196,153	2.86	87,108	-5.94	13.73	249	7.33	664	5.40	1997
1998	1,233,677	3.14	89,337	2.56	13.81	235	-5.62	669	0.75	1998
1999	1,281,248	3.86	98,191	9.91	13.05	252	7.23	698	4.33	1999
2000	1,288,400	0.56	94,477	-3.78	13.64	254	0.79	713	2.15	2000
2001	1,309,421	1.63	83,741	-11.36	15.64	340	33.86	691	-3.09	2001
2002	1,377,693	5.21	100,559	20.08	13.70	294	-13.53	695	0.58	2002
2003	1,351,444	-1.91	98,685	-1.86	13.69	282	-4.08	718	3.31	2003
2004	1,315,693	-2.65	92,279	-6.49	14.26	288	2.13	698	-2.79	2004
2005	1,394,532	5.99	100,090	8.46	13.93	287	-0.35	695	-0.43	2005
2006	1,414,020	1.40	108,976	8.88	12.98	300	4.53	693		

Electrical Consumption Growth 1995-2004		**Fuel Consumption Growth 1995-2004**		**Fuel Efficiency 1995-2004**	**Peak Load Growth 1995-2004**		**Population Growth 1995-2004**	
1995	1,131,587	1995	96,599	kW/gal	1995	255	1995	644
2004	1,315,693	2004	92,279		2004	288	2004	698
Period	16.27%	Period	-4.47%		Period	12.94%	Period	8.39%
Annualized	1.38%	Annualized	-0.42%	13.55	Annualized	1.11%	Annualized	0.73%

Electrical Consumption 1995-2006		**Fuel Consumption 1995-2006**		**Fuel Efficiency 1995-2006**	**Peak Load 1995-2006**		**Population 1995-2006**	
1995	1,131,587	1995	96,599	kW/gal	1995	255	1995	644
2006	1,414,020	2006	108,976		2006	300	2006	695
Period	24.96%	Period	12.81%		Period	17.65%	Period	7.61%
Annualized	2.05%	Annualized	1.10%	13.53	Annualized	1.49%	Annualized	0.67%

Electrical Consumption 2000-2003		**Fuel Consumption 2000-2003**		**Fuel Efficiency 2000-2003**	**Peak Load 2000-2003**		**Population 2000-2003**	
2000	1,288,400	2000	94,477	kW/gal	2000	254	2000	713
2003	1,351,444	2003	98,685		2003	282	2003	718
% change	4.89	% change	4.45	14.11	% change	11.02	% change	0.70


Kwethluk Peak Load Projection
y = 0.483x - 11330
y = 0.9202x - 21879
KiloWatt (kW)
450
400
350
300
250
200
150
100
50
0
1995
2000
2005
2010
2015
Fiscal Year
1995-2004 Historical
1995-2004 Annual Peaks
Historical Trend 1995-2017
Annual Peaks Trend 1995-2017

Trend Line Analysis of Historical Power Cost Equalization Program Data Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY 95	Jul	109			23940	151	
	Aug	189			23941	152	
	Sep	194			23942	152	
	Oct	225			23943	153	
	Nov	255	154	165%	23944	154	235
	Dec	141			23945	155	
	Jan	233			23946	156	
	Feb	167			23947	157	
	Mar	169			23948	158	
	Apr	123			23949	159	
	May	127			23950	160	
	Jun	111			23951	161	
FY 96	Jul	121			23952	162	
	Aug	161			23953	163	
	Sep	149			23954	163	
	Oct	196			23955	164	
	Nov	232	165	140%	23956	165	241
	Dec	206			23957	166	
	Jan	202			23958	167	
	Feb	211			23959	168	
	Mar	156			23960	169	
	Apr	143			23961	170	
	May	106			23962	171	
	Jun	97			23963	172	
FY 97	Jul	141			23964	173	
	Aug	134			23965	174	
	Sep	189			23966	175	
	Oct	179			23967	175	
	Nov	249	176	141%	23968	176	247
	Dec	228			23969	177	
	Jan	242			23970	178	
	Feb	221			23971	179	
	Mar	215			23972	180	
	Apr	217			23973	181	
	May	118			23974	182	
	Jun	108			23975	183	

Trend Line Analysis of Historical
Power Cost Equalization Program Data
Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY 98	Jul	119			23976	184	
	Aug	109			23977	185	
	Sep	195			23978	186	
	Oct	235	186	126%	23979	186	252
	Nov	174			23980	187	
	Dec	217			23981	188	
	Jan	187			23982	189	
	Feb	172			23983	190	
	Mar	183			23984	191	
	Apr	116			23985	192	
	May	135			23986	193	
	Jun	135			23987	194	
FY 99	Jul	143			23988	195	
	Aug	137			23989	196	
	Sep	159			23990	197	
	Oct	194			23991	198	
	Nov	252	198	127%	23992	198	258
	Dec	196			23993	199	
	Jan	202			23994	200	
	Feb	154			23995	201	
	Mar	227			23996	202	
	Apr	195			23997	203	
	May	167			23998	204	
	Jun	137			23999	205	
FY 00	Jul	147			24000	206	
	Aug	199			24001	207	
	Sep	199			24002	208	
	Oct	225			24003	209	
	Nov	225			24004	209	
	Dec	246			24005	210	
	Jan	254	211	120%	24006	211	265
	Feb	101			24007	212	
	Mar	225			24008	213	
	Apr	167			24009	214	
	May	167			24010	215	
	Jun	160			24011	216	

Trend Line Analysis of Historical
Power Cost Equalization Program Data
Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY 01	Jul	194			24012	217	
	Aug	227			24013	218	
	Sep	240			24014	219	
	Oct	253			24015	220	
	Nov	340	221	154%	24016	221	270
	Dec	275			24017	221	
	Jan	260			24018	222	
	Feb	265			24019	223	
	Mar	239			24020	224	
	Apr	247			24021	225	
	May	237			24022	226	
	Jun	187			24023	227	
FY 02	Jul	183			24024	228	
	Aug	227			24025	229	
	Sep	244			24026	230	
	Oct	268			24027	231	
	Nov	268			24028	232	
	Dec	294	232	126%	24029	232	276
	Jan	237			24030	233	
	Feb	264			24031	234	
	Mar	245			24032	235	
	Apr	247			24033	236	
	May	244			24034	237	
	Jun	196			24035	238	
FY 03	Jul	176			24036	239	
	Aug	222			24037	240	
	Sep	235			24038	241	
	Oct	265			24039	242	
	Nov	265			24040	243	
	Dec	271			24041	244	
	Jan	265			24042	244	
	Feb	263			24043	245	
	Mar	282	246	114%	24044	246	283
	Apr	258			24045	247	
	May	248			24046	248	
	Jun	209			24047	249	

Trend Line Analysis of Historical
Power Cost Equalization Program Data
Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY 04	Jul	202			24048	250	
	Aug	222			24049	251	
	Sep	248			24050	252	
	Oct	273			24051	253	
	Nov	268			24052	254	
	Dec	288	255	113%	24053	255	288
	Jan	271			24054	255	
	Feb	270			24055	256	
	Mar	247			24056	257	
	Apr	257			24057	258	
	May	249			24058	259	
	Jun	240			24059	260	
FY 05	Jul	181			24060	261	
	Aug	205			24061	262	
	Sep	247			24062	263	
	Oct	255			24063	264	
	Nov	273			24064	265	
	Dec	287	266	108%	24065	266	293
	Jan	281			24066	267	
	Feb	280			24067	267	
	Mar	271			24068	268	
	Apr	262			24069	269	
	May	230			24070	270	
	Jun	230			24071	271	
FY 06	Jul	203			24072	272	
	Aug	230			24073	273	
	Sep	268			24074	274	
	Oct	272			24075	275	
	Nov	272			24076	276	
	Dec	279			24077	277	
	Jan	300	278	108%	24078	278	300
	Feb	270			24079	278	
	Mar	272			24080	279	
	Apr	267			24081	280	
	May	236			24082	281	
	Jun	177			24083	282	

Trend Line Analysis of Historical Power Cost Equalization Program Data Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY 07	Jul	232			24084	283	
	Aug	242			24085	284	
	Sep	262			24086	285	
	Oct				24087	286	
	Nov				24088	287	
	Dec				24089	288	
	Jan				24090	289	305
	Feb				24091	290	
	Mar				24092	290	
	Apr				24093	291	
	May				24094	292	
	Jun				24095	293	
FY 08	Jul				24096	294	
	Aug				24097	295	
	Sep				24098	296	
	Oct				24099	297	
	Nov				24100	298	
	Dec				24101	299	
	Jan				24102	300	
	Feb				24103	301	
	Mar				24104	302	
	Apr				24105	302	
	May				24106	303	
	Jun				24107	304	
FY 09	Jul				24108	305	
	Aug				24109	306	
	Sep				24110	307	
	Oct				24111	308	
	Nov				24112	309	
	Dec				24113	310	317
	Jan				24114	311	
	Feb				24115	312	
	Mar				24116	313	
	Apr				24117	313	
	May				24118	314	
	Jun				24119	315	

Trend Line Analysis of Historical
Power Cost Equalization Program Data
Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY 10	Jul				24120	316	
	Aug				24121	317	
	Sep				24122	318	
	Oct				24123	319	
	Nov				24124	320	
	Dec				24125	321	322
	Jan				24126	322	
	Feb				24127	323	
	Mar				24128	324	
	Apr				24129	325	
	May				24130	325	
	Jun				24131	326	
FY 11	Jul				24132	327	
	Aug				24133	328	
	Sep				24134	329	
	Oct				24135	330	
	Nov				24136	331	
	Dec				24137	332	328
	Jan				24138	333	
	Feb				24139	334	
	Mar				24140	335	
	Apr				24141	336	
	May				24142	336	
	Jun				24143	337	
FY 12	Jul				24144	338	
	Aug				24145	339	
	Sep				24146	340	
	Oct				24147	341	
	Nov				24148	342	
	Dec				24149	343	334
	Jan				24150	344	
	Feb				24151	345	
	Mar				24152	346	
	Apr				24153	347	
	May				24154	348	
	Jun				24155	348	

Trend Line Analysis of Historical
Power Cost Equalization Program Data
Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY 13	Jul				24156	349	
	Aug				24157	350	
	Sep				24158	351	
	Oct				24159	352	
	Nov				24160	353	
	Dec				24161	354	340
	Jan				24162	355	
	Feb				24163	356	
	Mar				24164	357	
	Apr				24165	358	
	May				24166	359	
	Jun				24167	359	
FY 14	Jul				24168	360	
	Aug				24169	361	
	Sep				24170	362	
	Oct				24171	363	
	Nov				24172	364	
	Dec				24173	365	346
	Jan				24174	366	
	Feb				24175	367	
	Mar				24176	368	
	Apr				24177	369	
	May				24178	370	
	Jun				24179	371	
FY15	Jul				24180	371	
	Aug				24181	372	
	Sep				24182	373	
	Oct				24183	374	
	Nov				24184	375	
	Dec				24185	376	351
	Jan				24186	377	
	Feb				24187	378	
	Mar				24188	379	
	Apr				24189	380	
	May				24190	381	
	Jun				24191	382	

Trend Line Analysis of Historical
Power Cost Equalization Program Data
Kwethluk, Alaska

Fiscal Period (Year)	(Month)	Peak Load (kW)	Trend Load (kW)	Peak Load to Trend Load (%)	Trend Line "X" Value in Months (since 0 A.D.)	Trend Line Load (Historical) (kW)	Trend Line Load (Annual Peak) (kW)
FY16	Jul				24192	382	
	Aug				24193	383	
	Sep				24194	384	
	Oct				24195	385	
	Nov				24196	386	
	Dec				24197	387	357
	Jan				24198	388	
	Feb				24199	389	
	Mar				24200	390	
	Apr				24201	391	
	May				24202	392	
	Jun				24203	393	
FY17	Jul				24204	394	
	Aug				24205	394	
	Sep				24206	395	
	Oct				24207	396	
	Nov				24208	397	
	Dec				24209	398	363
	Jan				24210	399	
	Feb				24211	400	
	Mar				24212	401	
	Apr				24213	402	
	May				24214	403	
	Jun				24215	404	

Kwethluk PCE Data

Fiscal Year	Fiscal Month	Utility	Diesel kWh Generation	Diesel (gallons)	Station Service	Peak kW Demand
1995	1	Kwethluk, Inc.	63,616	5,218	419	109
1995	2	Kwethluk, Inc.	76,212	7,339	441	189
1995	3	Kwethluk, Inc.	86,602	7,926	557	194
1995	4	Kwethluk, Inc.	101,788	7,339	1,889	225
1995	5	Kwethluk, Inc.	109,766	9,657	5,312	255
1995	6	Kwethluk, Inc.	124,036	10,127	6,549	141
1995	7	Kwethluk, Inc.	110,971	9,150	5,515	233
1995	8	Kwethluk, Inc.	102,694	8,571	4,148	167
1995	9	Kwethluk, Inc.	118,208	9,656	4,603	169
1995	10	Kwethluk, Inc.	87,231	7,821	2,223	123
1995	11	Kwethluk, Inc.	83,989	8,460	1,022	127
1995	12	Kwethluk, Inc.	66,474	5,335	525	111
Sub-Total			1,131,587	96,599	33,203	
1996	1	Kwethluk, Inc.	63,688	5,216	409	121
1996	2	Kwethluk, Inc.	78,149	6,949	488	161
1996	3	Kwethluk, Inc.	97,357	8,329	1,694	149
1996	4	Kwethluk, Inc.	103,271	9,127	3,857	196
1996	5	Kwethluk, Inc.	113,900	9,054	6,507	232
1996	6	Kwethluk, Inc.	128,409	9,245	7,771	206
1996	7	Kwethluk, Inc.	107,229	9,344	7,850	202
1996	8	Kwethluk, Inc.	106,295	7,925	6,986	211
1996	9	Kwethluk, Inc.	111,598	7,863	5,485	156
1996	10	Kwethluk, Inc.	95,888	7,415	4,756	143
1996	11	Kwethluk, Inc.	88,757	6,902	1,305	106
1996	12	Kwethluk, Inc.	68,364	5,238	1,565	97
Sub-Total			1,162,905	92,607	48,673	
1997	1	Kwethluk, Inc.	71,430	5,639	1,374	141
1997	2	Kwethluk, Inc.	85,165	6,388	1,160	134
1997	3	Kwethluk, Inc.	93,214	6,679	1,687	189
1997	4	Kwethluk, Inc.	102,651	7,091	5,953	179
1997	5	Kwethluk, Inc.	117,529	8,839	9,708	249
1997	6	Kwethluk, Inc.	121,653	8,836	11,287	228
1997	7	Kwethluk, Inc.	123,518	9,240	10,773	242
1997	8	Kwethluk, Inc.	98,688	7,389	5,563	221
1997	9	Kwethluk, Inc.	117,074	7,598	8,397	215
1997	10	Kwethluk, Inc.	100,395	6,999	3,742	217
1997	11	Kwethluk, Inc.	95,323	6,914	2,666	118
1997	12	Kwethluk, Inc.	69,513	5,496	604	108
Sub-Total			1,196,153	87,108	62,914	

Kwethluk PCE Data

Fiscal Year	Fiscal Month	Utility	Diesel kWh Generation	Diesel (gallons)	Station Service	Peak kW Demand
1998	1	Kwethluk, Inc.	70,588	5,599	666	119
1998	2	Kwethluk, Inc.	89,381	6,590	2,021	109
1998	3	Kwethluk, Inc.	95,834	6,766	3,507	195
1998	4	Kwethluk, Inc.	114,199	7,768	7,414	235
1998	5	Kwethluk, Inc.	117,203	8,943	8,076	174
1998	6	Kwethluk, Inc.	119,676	8,089	8,593	217
1998	7	Kwethluk, Inc.	133,546	8,803	8,249	187
1998	8	Kwethluk, Inc.	103,402	7,540	8,151	172
1998	9	Kwethluk, Inc.	110,438	8,692	6,155	183
1998	10	Kwethluk, Inc.	100,290	7,222	3,943	116
1998	11	Kwethluk, Inc.	98,286	7,227	2,191	135
1998	12	Kwethluk, Inc.	80,834	6,098	2,108	135
Sub-Total			1,233,677	89,337	61,074	
1999	1	Kwethluk, Inc.	94,273	6,436	2,198	143
1999	2	Kwethluk, Inc.	83,523	6,932	2,010	137
1999	3	Kwethluk, Inc.	97,154	6,780	3,390	159
1999	4	Kwethluk, Inc.	106,883	7,778	5,229	194
1999	5	Kwethluk, Inc.	114,252	9,449	3,606	252
1999	6	Kwethluk, Inc.	129,491	9,277	9,857	196
1999	7	Kwethluk, Inc.	128,553	9,831	10,608	202
1999	8	Kwethluk, Inc.	113,929	9,652	9,264	154
1999	9	Kwethluk, Inc.	121,543	8,309	9,240	227
1999	10	Kwethluk, Inc.	108,064	7,737	5,175	195
1999	11	Kwethluk, Inc.	101,461	7,619	4,249	167
1999	12	Kwethluk, Inc.	82,122	8,391	3,415	137
Sub-Total			1,281,248	98,191	68,241	
2000	1	Kwethluk, Inc.	79,203	6,150	2,498	147
2000	2	Kwethluk, Inc.	100,738	7,205	1,872	199
2000	3	Kwethluk, Inc.	100,738	7,122	1,846	199
2000	4	Kwethluk, Inc.	119,791	8,565	3,995	225
2000	5	Kwethluk, Inc.	116,356	8,361	6,443	225
2000	6	Kwethluk, Inc.	129,931	8,707	6,636	246
2000	7	Kwethluk, Inc.	121,190	10,246	9,111	254
2000	8	Kwethluk, Inc.	119,411	8,034	5,106	101
2000	9	Kwethluk, Inc.	118,003	8,602	7,641	225
2000	10	Kwethluk, Inc.	99,645	7,968	6,636	167
2000	11	Kwethluk, Inc.	104,253	7,475	4,537	167
2000	12	Kwethluk, Inc.	79,141	6,042	954	160
Sub-Total			1,288,400	94,477	57,275	

Kwethluk PCE Data

Fiscal Year	Fiscal Month	Utility	Diesel kWh Generation	Diesel (gallons)	Station Service	Peak kW Demand
2001	1	Kwethluk, Inc.	82,623	6,673	490	173
2001	2	Kwethluk, Inc.	104,869	9,047	1,259	227
2001	3	Kwethluk, Inc.	104,334	11,130	4,039	240
2001	4	Kwethluk, Inc.	115,964	8,643	4,557	253
2001	5	Kwethluk, Inc.	115,280	8,372	4,006	340
2001	6	Kwethluk, Inc.	125,501	9,340	3,831	275
2001	7	Kwethluk, Inc.	121,681		2,563	260
2001	8	Kwethluk, Inc.	114,156		4,982	265
2001	9	Kwethluk, Inc.	120,411	6,506	4,863	239
2001	10	Kwethluk, Inc.	109,117	8,988	2,608	247
2001	11	Kwethluk, Inc.	109,252	8,236	4,633	237
2001	12	Kwethluk, Inc.	86,233	6,806	454	187
Sub-Total			1,309,421	83,741	38,285	
2002	1	Kwethluk, Inc.	88,353	6,674	1,228	183
2002	2	Kwethluk, Inc.	102,074	7,472	1,481	227
2002	3	Kwethluk, Inc.	108,043	7,848	2,319	244
2002	4	Kwethluk, Inc.	125,948	8,976	4,593	268
2002	5	Kwethluk, Inc.	130,957	9,061	7,085	268
2002	6	Kwethluk, Inc.	137,471	9,513	8,506	294
2002	7	Kwethluk, Inc.	133,620	9,483	6,645	237
2002	8	Kwethluk, Inc.	119,346	8,883	6,513	264
2002	9	Kwethluk, Inc.	125,486	9,059	5,207	245
2002	10	Kwethluk, Inc.	114,303	8,602	3,859	247
2002	11	Kwethluk, Inc.	105,510	8,016	1,614	244
2002	12	Kwethluk, Inc.	86,582	6,972	459	196
Sub-Total			1,377,693	100,559	49,509	
2003	1	Kwethluk, Inc.	87,009	6,905	472	176
2003	2	Kwethluk, Inc.	81,802	7,199	387	222
2003	3	Kwethluk, Inc.	105,342	7,406	476	235
2003	4	Kwethluk, Inc.	118,225	8,338	1,410	265
2003	5	Kwethluk, Inc.	123,917	8,439	2,422	265
2003	6	Kwethluk, Inc.	130,442	9,095	3,971	271
2003	7	Kwethluk, Inc.	135,052	9,752	6,002	265
2003	8	Kwethluk, Inc.	120,272	8,579	4,215	263
2003	9	Kwethluk, Inc.	132,240	9,383	6,678	282
2003	10	Kwethluk, Inc.	115,158	8,273	4,684	258
2003	11	Kwethluk, Inc.	109,840	8,178	2,811	248
2003	12	Kwethluk, Inc.	92,145	7,138	891	209
Sub-Total			1,351,444	98,685	34,419	

Kwethluk PCE Data

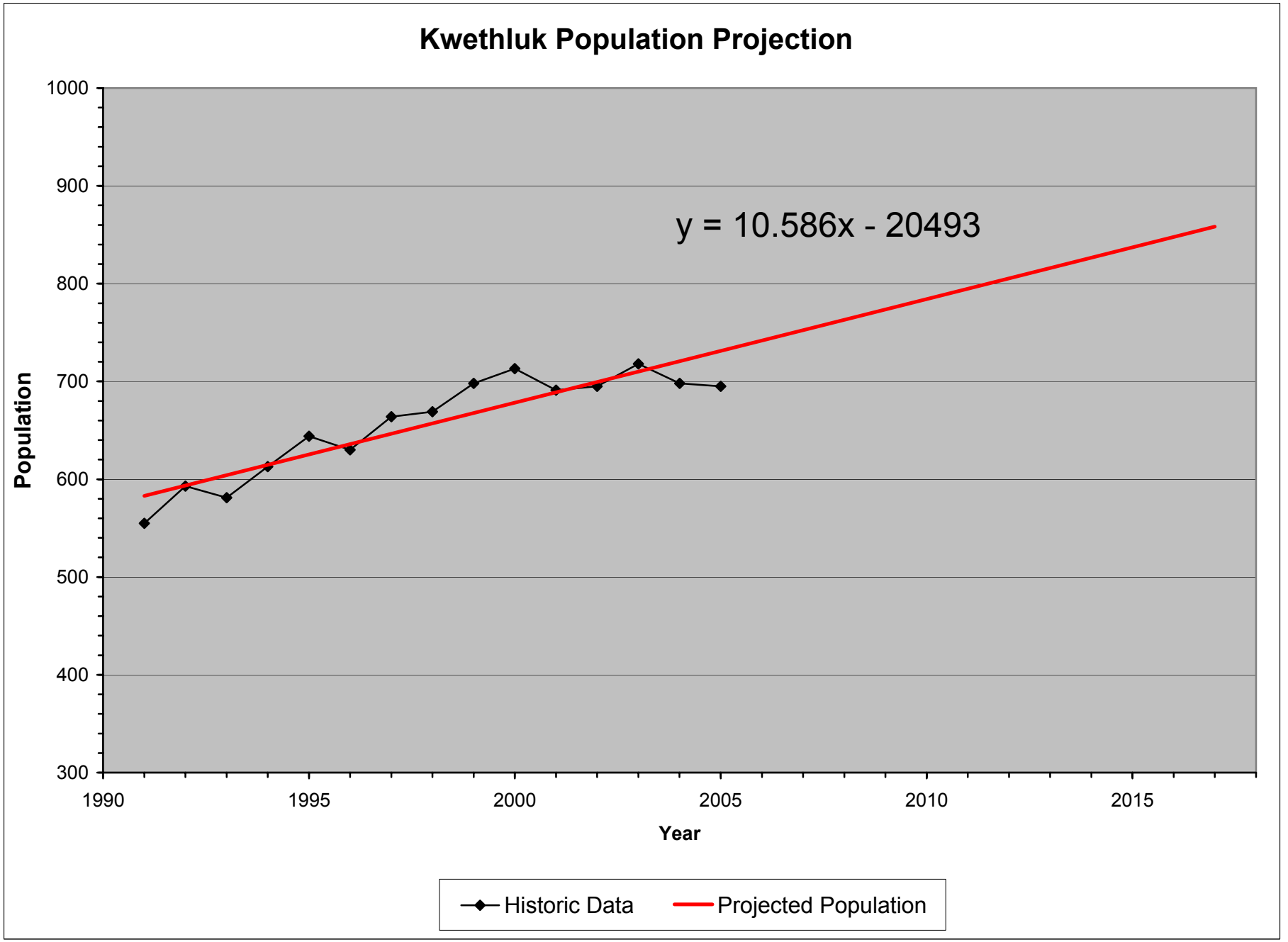
Fiscal Year	Fiscal Month	Utility	Diesel kWh Generation	Diesel (gallons)	Station Service	Peak kW Demand
2004	1	Kwethluk, Inc.	94,701	7,213	736	202
2004	2	Kwethluk, Inc.	102,147	7,713	745	222
2004	3	Kwethluk, Inc.	110,404	8,493	1,606	
2004	4	Kwethluk, Inc.	131,356	9,306	4,470	273
2004	5	Kwethluk, Inc.	125,425	8,861	5,537	268
2004	6	Kwethluk, Inc.	135,837	10,646	8,774	288
2004	7	Kwethluk, Inc.	133,547	10,011	6,400	271
2004	8	Kwethluk, Inc.	125,309	6,760	5,188	270
2004	9	Kwethluk, Inc.	132,295	7,193	4,882	247
2004	10	Kwethluk, Inc.	116,451	8,019	2,214	257
2004	12	Kwethluk, Inc.	108,221	8,064	1,944	240
Sub-Total			1,315,693	92,279	42,496	
2005	1	Kwethluk, Inc.	88,351	6,599	2,129	181
2005	2	Kwethluk, Inc.	100,597	7,228	2,131	205
2005	3	Kwethluk, Inc.	106,590	9,682	1,994	247
2005	4	Kwethluk, Inc.	122,654	8,727	2,345	255
2005	5	Kwethluk, Inc.	129,513	9,107	4,182	273
2005	6	Kwethluk, Inc.	137,671	10,249	6,326	287
2005	7	Kwethluk, Inc.	141,388	8,709	8,683	281
2005	8	Kwethluk, Inc.	126,613	8,857	7,542	280
2005	9	Kwethluk, Inc.	134,239	9,534	8,221	271
2005	10	Kwethluk, Inc.	121,153	8,626	7,256	262
2005	11	Kwethluk, Inc.	103,046	7,687	2,073	230
2005	12	Kwethluk, Inc.	82,717	5,085	996	230
Sub-Total			1,394,532	100,090	53,878	
2006	1	Kwethluk, Inc.	85,513	6,495	698	203
2006	2	Kwethluk, Inc.	109,704	9,212	698	230
2006	3	Kwethluk, Inc.	116,857	9,104	2,615	268
2006	4	Kwethluk, Inc.	128,376	9,390	4,413	272
2006	5	Kwethluk, Inc.	132,348	10,777	7,910	272
2006	6	Kwethluk, Inc.	136,768	10,184	6,618	279
2006	7	Kwethluk, Inc.	136,545	9,796	8,528	300
2006	8	Kwethluk, Inc.	124,372	8,910	6,821	270
2006	9	Kwethluk, Inc.	131,774	10,501	7,277	272
2006	10	Kwethluk, Inc.	117,921	9,007	5,810	267
2006	11	Kwethluk, Inc.	106,590	8,448	4,679	236
2006	12	Kwethluk, Inc.	87,252	7,152	3,543	177
Sub-Total			1,414,020	108,976	59,610	
2007	2	Kwethluk, Inc.	106,750	8,356	2,192	232
2007	3	Kwethluk, Inc.	115,062	9,004	1,964	242
2007	4	Kwethluk, Inc.	132,106	9,799	4,425	262

APPENDIX G

POPULATION TREND ANALYSIS

Kwethluk Population Projection Graph

The following graph depicting historical and projected population growth for Kwethluk, Alaska is based on trend analysis of Alaska Department of Labor and Workforce Development data. Linear regression of 14 years of historical annual population data, from 1991 through 2005, was used to project the population growth trend to the year 2017.


Kwethluk Population Projection
y = 10.586x - 20493
Population
1000
900
800
700
600
500
400
300
1990
1995
2000
2005
2010
2015
Year
Historic Data
Projected Population

Trend Line Analysis of
State of Alaska Department of Labor Population Estimates
Kwethluk, Alaska

Year	DOL Population	DOL % Change	Trend Line Population	Trend Line % Change
1991	555	-	584	-
1992	593	6.85	594	1.81
1993	581	-2.02	605	1.78
1994	613	5.51	615	1.75
1995	644	5.06	626	1.72
1996	630	-2.17	637	1.69
1997	664	5.40	647	1.66
1998	669	0.75	658	1.64
1999	698	4.33	668	1.61
2000	713	2.15	679	1.58
2001	691	-3.09	690	1.56
2002	695	0.58	700	1.54
2003	718	3.31	711	1.51
2004	698	-2.79	721	1.49
2005	695	-0.43	732	1.47
2006			743	1.45
2007			753	1.43
2008			764	1.41
2009			774	1.39
2010			785	1.37
2011			795	1.35
2012			806	1.33
2013			817	1.31
2014			827	1.30
2015			838	1.28
2016			848	1.26
2017			859	1.25

APPENDIX H

DENALI COMMISSION POLICIES

ENERGY PROJECT DESIGN CAPACITY POLICY (April 2002)

a. The design capacity for power system projects shall be based on the projected village power requirements for not less than five nor more than ten years. The design capacity for power plant projects must provide sufficient firm capacity to ensure reliable power with acceptable fuel efficiency. The minimum firm generation capacity is that required to carry the system's peak loads after the loss of the single largest generating unit in the power plant.

b. Where feasible, the design layout should allow space for future expansion of capacity to meet the anticipated requirements for at least twenty years.

c. The rate of change of population increase or decrease over the past ten years and population projections by village leaders, state agencies and others shall be taken into consideration.

d. Historical power production and consumption data shall be taken into consideration, including the most recent data of the Power Cost Equalization Program and the rate of change over time.

e. Where fuel delivery is by barge, thirteen months of storage capacity is recommended, depending on local conditions and freight logistics. Where fuel delivery is by air, two to three months of storage capacity is recommended, depending on local conditions and freight logistics. If the design includes both barge and airport headers, village input and anticipated fuel costs shall be included in the determination of tank farm capacity.

f. Designers shall take into account seasonal variations in fuel consumption.

g. Infrastructure development projects may impact storage capacity requirements by increasing fuel and electric energy consumption. Designers shall investigate current and anticipated projects by interviewing village leaders, reviewing the Department of Community and Economic Development Grants Database, and contacting other agencies such as Village Safe Water, Alaska Energy Authority, Alaska Native Tribal Health Consortium, Department of Transportation and Public Facilities, the local school district, etc. Where an adopted comprehensive community development plan exists, that plan shall be taken into account in forecasting the design capacity of facilities.

h. Project managers and/or designers are to explain the disadvantages of excess power plant generating capacity to participants, such as decreased fuel efficiency with oversized generators, and increased costs for capital renewal and replacement, insurance, operations and maintenance. These additional costs must be factored into the business plan cost tables and will result in a per kilowatt-hour cost increase for project participants.

COST CONTAINMENT FOR ENERGY PROJECTS POLICY (Revised April 2002)

a. ***Cost Effective Designs.*** Cost containment requires that designs provide cost-effective solutions for the needs of Alaskan communities. Capacity and other design and site decisions should be based on a comprehensive community plan. Designs should be selected that address the identified needs in the most cost-effective manner feasible, considering operational and maintenance costs as well as construction costs to yield the lowest life cycle costs. This may mean implementing innovative technologies that provide real life cycle cost savings; or it may mean using very simple technologies that are sufficiently effective instead of more expensive approaches that increase costs without substantial benefit.

b. ***Need Specific Designs.*** Project cost containment dictates that designs directly provide real, substantial and quantifiable benefits addressing specific Alaskan community needs. Designs should not be expanded to address other needs or desires within the community, unless those increased costs are funded from another source or explicitly approved by the Commission. Similarly, designs should not be based on unrealistic or unsubstantiated estimates for increased demand (see Commission Policy for Energy Design Capacity). Projects should not result in expenditures for items providing little or no real benefit, or that are outside the program goals. Design components need to be limited to items that address real, identified needs in a beneficial manner, and are not merely "convenience" items. Required components should not be "over-designed" for the sake of community convenience, nor based on unreasonable projections.

c. ***Competitive Procurement***. Cost containment requires that products, labor, materials, transportation, services, and other items must be provided at fair and cost-competitive prices for best value considering all the Denali Commission goals.

d. ***Effective Project Management***. Cost containment requires that actual construction activities be competently managed to minimize or eliminate costs associated with scheduling, vendor coordination, material delivery, efficient utilization of labor and similar items. This will result in minimizing or eliminating unexpected costs from delays or other issues.

e. ***Maximization of Cost Benefit via Project Selection***. Part of cost containment is ensuring the greatest benefit for the cost. If a project exhibits abnormally high unit costs, even for valid reasons, the overall greatest benefit may be to fund projects with equally valid needs that can be completed for lower unit costs.

f. ***Cost Containment Parameters***. The following unit costs are to be calculated as the total project budget divided by the total design power generation capacity. A larger capacity project should relate to the lower end of the cost range for each capacity level.

Capacity Benchmark Unit Costs:	
0 – 200 kilowatts	$5,500 to $3,500 per kilowatt
201 – 400 kilowatts	$3,500 to $2,900 per kilowatt
400 – 600 kilowatts	$2,900 to $2,400 per kilowatt
601 – 800 kilowatts	$2,400 to $1,900 per kilowatt
801 – 1,000 kilowatts	$1,900 to $1,600 per kilowatt
1,001 – 1,200 kilowatts	$1,600 to $1,250 per kilowatt
Greater than 1,200 kilowatts	$1,250 to $500 per kilowatt

INVESTMENT POLICY (April 2004)

General Policy

Commission investments are directed by federal law, by the Commission's Guiding Principles, and by specific allocation decisions made by the Commission. Infrastructure needs of rural Alaska are enormous compared to available funding; thus, it is imperative that each dollar be invested in a way that will maximize the sustainable long term benefits to Alaskans. The Commission will promote investment in infrastructure where the promise of sustainability (facility and services) can reasonably be demonstrated both now and in the future. Infrastructure sustainability can be enhanced by adapting available technology and appropriately sizing facilities to meet the particular needs and circumstances of communities.

Factors which will influence investment decisions:

a. ***Imminent environmental threats.*** Facilities will be placed so as to be protected from imminent environmental threats such as flooding and erosion. Long term investments generally will not be made in areas that are subject to imminent environmental threats.

b. ***Priority to be placed on needs of existing communities.*** The Commission will give priority to the critical infrastructure needs of existing communities before considering proposals to create new communities, unless there is a congressionally directed relocation of an existing community.

c. ***Regional support.*** The Commission recognizes that borough and local governments promote equity among Alaskans, and that the existence of a state-chartered government increases the probability that basic infrastructure and services provided with Denali Commission funds will be sustained over the long term. The Commission also recognizes that other regional organizations share both responsibility and capacity to contribute to sustainability. Consistency with a regionally approved plan is a factor lending strength to investing in a particular project.

d. ***Proximity/access to existing services and/or facilities.*** In determining the need for a new facility, a careful evaluation of existing access to services or facilities will be performed. Where the needs of two or more communities in close proximity to one another can be adequately and more cost effectively served by a single facility, that option will be selected over separate facilities for each community. Investments will be made where critical unmet needs are demonstrated.

e. ***Renovation versus new construction.*** Where existing facilities can be renovated or expanded to adequately meet community needs at significantly lower life-cycle costs than new construction, that option will be favored.

f. ***Population trends.*** Infrastructure will be sized to meet needs that can reasonably be projected over the design life of the project. If population is increasing, appropriate excess capacity will be provided to accommodate growth. Decreasing population may result in a smaller facility than the current population would dictate. For communities with populations declining 20% or greater over a 10-year census period, and where there is indication such trends will continue, special attention will be given to appropriate design and sizing of facilities.

g. ***Affordability.*** The Commission will evaluate proponents' capacities to afford the life-cycle costs associated with sustaining proposed services and/or facilities, either through user fees, industry support, government transfer payments or grants from private entities.

h. ***Per capita investment.*** While there are many factors which may explain extreme variations in per capita investment in communities, the Commission will compile and review this data to ensure that there is reasonable equity in the distribution of funds across all rural Alaska communities.

SUSTAINABILITY POLICY OF ELECTRIC UTILITY SYSTEMS (April 2002):

a. The utility is operating in substantial conformance with a business and work plan under a margin that is consistent with its long-range financial needs. A renewal and replacement fund will be established and sufficient funds will be accrued to cover the projected costs of major repairs, renovations, renewals, and replacement of major plant components.

b. The utility system is in compliance with the laws and regulations that govern its operation.

c. The utility provides for adequate preventive and scheduled maintenance of its facilities, and keeps its facilities in good condition and repair.

d. The utility arranges for annual financial audits that are conducted by qualified, independent auditors, and which consistently find no significant financial irregularities.

e. The utility is not in default with respect to any of its financial obligations, including debts, taxes, or other established liabilities.

f. Rates are based on cost of service such that no customer class subsidizes another to a significant extent, and the risks of possible loss of large consumers are minimized by power sales agreements that protect the economics of a utility's operations.

g. The utility maintains adequate business insurance covering all significant risks. Self-insurance will be allowed for specific risks, provided the utility can clearly demonstrate how adequate funds would be made available in a timely fashion to satisfy possible claims.

h. The utility has a credible business and work plan that is updated no less frequently than once every five years, and that includes provision for adequate preventive and scheduled maintenance, a ten-year capital replacement and expansion plan, a ten-year financial forecast, and a rate structure analysis.

i. In the case of joint ventures, the utility has sufficient management control or other contractual safeguards with respect to the construction and operation of jointly owned facilities to ensure that the utility's interests are protected and the utility lender's credit risk is minimized.

j. Where rates or investment decisions are subject to approval by regulatory authorities, there is reasonable expectation that such approvals regarding development of the project will be forthcoming.

APPENDIX I

BUDGET LEVEL COST ESTIMATES

BUDGET COST ESTIMATE
Kwethluk Power Plant
Gravel Pad Foundation

PROJECT: Kwethluk Power Plant
PROJECT No.: 06-764
LEVEL: Budget
DATE: 6/14/2007
REFERENCE DRAWING(S): Conceptual Design
BASIS: Competitive Bid
FREIGHT RATE: $0.55/lb

COST SUMMARY

Construction Cost	**3,253,250**
Miscellaneous Project Costs	**256,813**
Project Total:	**$3,510,063**
$/kW (1,100 kW):	**$3,191**

BUDGET COST ESTIMATE
Kwethluk Power Plant
Gravel Pad Foundation

No.	ITEM	QTY	UNITS	MATERIAL UNIT COST	MATERIAL MATL TOTAL	LABOR MAN DAYS	LABOR UNIT COST	LABOR LABOR TOTAL	OTHER OR EQUIP RENT	FREIGHT	TOTAL
Estimated Project Duration		90	DAYS								
Foreman/Operator		1	EA								
Carpenters/Welders		2	EA								
Local Labor		4	EA								
Labor - not included in building construction (based on 60 hours per week)											**171,800**
1	Project Manager		MD's			44	800	35,200			35,200
2	Foreman/Operator		MD's			44	700	30,800			30,800
3	Carpenters/Welders		MD's			82	700	57,400			57,400
4	Local Labor		MD's			88	550	48,400			48,400
Miscellaneous											**264,515**
5	Mob/DeMob	1	SUM	20,000	20,000						20,000
6	Crew Per Diem	170	MD's	50	8,500						8,500
7	Crew Housing	170	MD's	50	8,500						8,500
8	Crane Rental	2	MO	20,000					40,000	12,000	52,000
9	Skid Steer Rental	4	MO	3,925					15,700	4,710	20,410
10	Welder Rental	4	MO	4,000					16,000	4,800	20,800
11	Dump Truck Rental	2	MO	5,000					10,000	3,000	13,000
12	Pick-up Truck Rental	4	MO	1,500					6,000	1,800	7,800
13	Bulldozer Rental	2	MO	8,000					16,000	4,800	20,800
14	Loader Rental	2	MO	12,000					24,000	7,200	31,200
15	Compactor Rental	2	MO	3,675					7,350	2,205	9,555
16	Fuel	1	LS	8,000	8,000				8,000	2,400	18,400
17	Tool Rental	4	MO	4,000					16,000	4,800	20,800
18	Consumables	1	LS	5,000	5,000				5,000	2,750	12,750
Foundation Construction											**266,500**
19	Gravel Pad[2]	1,400	CY	120	168,000						168,000
20	Concrete Foundation[2]	85	CY	650	55,250						55,250
21	Misc.-Rebar, Forms, etc.	1	LS	14,400	14,400					11,000	25,400
22	Fencing & Gates	350	FT	20	7,000		20.00	7,000		3,850	17,850
Building/Generation Equipment/Mechanical & Electrical/Etc.[3]											**1,125,000**
23	Building	1	LS	100,000	100,000			100,000		55,000	255,000
24	Generators and Switchgear	1	LS	450,000	450,000			30,000		14,000	494,000
25	Mechanical & Electrical Systems	1	LS	200,000	200,000			100,000		16,000	316,000
26	Housing/Per-diem/Fuel/Training-Etc	1	LS	30,000	30,000			30,000			60,000

BUDGET COST ESTIMATE
Kwethluk Power Plant
Gravel Pad Foundation

No.	ITEM	QTY	UNITS	MATERIAL UNIT COST	MATERIAL MATL TOTAL	LABOR MAN DAYS	LABOR UNIT COST	LABOR TOTAL	OTHER OR EQUIP RENT	FREIGHT	TOTAL
Waste Heat Recovery											**370,000**
27	Power Plant Connection	1	LS	50,000	50,000						50,000
28	School Connection	1	LS	70,000	70,000						70,000
29	Pipeline	2,400	FT	50	120,000	50		120,000		10,000	250,000
System Connections											**25,000**
30	Village system connection[1]	1	LS	25,000	25,000						25,000
Upgrades to Distribution System[1]											**187,000**
31	Distribution system upgrades	1	LS	187,000	187,000						187,000
				Subtotals	1,526,650			558,800	164,050	160,315	2,409,815
									Contingency @	10%	240,982
									Overhead @	15%	361,472
									Profit @	10%	240,982
										Construction Total:	**3,253,250**

[1] Estimate per quote by Greg Errico. Includes materials, freight, and labor.
[2] Includes materials and freight.
[3] Per estimate provided by AE&E

MISCELLANEOUS COSTS

31	Project Insurance	20,000
32	Site Control Legal Work	15,000
33	Engineering Allowance	110,000
34	Construction Management Allowance	100,000
35	Grant Audit	4,000
36	Fire Marshall Review Fee	7,813
	Misc. Cost Total =	**256,813**

BUDGET COST ESTIMATE
Kwethluk Power Plant
Pile Foundation

PROJECT:	Kwethluk Power Plant
PROJECT No.:	06-764
LEVEL:	Budget
DATE:	6/14/2007
REFERENCE DRAWING(S):	Conceptual Design
BASIS:	Competitive Bid
FREIGHT RATE:	$0.55/lb

COST SUMMARY

Construction Cost	**3,197,100**
Miscellaneous Project Costs	**256,700**
Project Total:	**$3,453,800**
$/kW (1,100 kW):	**$3,140**

BUDGET COST ESTIMATE
Kwethluk Power Plant
Pile Foundation

No.	ITEM	QTY	UNITS	MATERIAL UNIT COST	MATERIAL MATL TOTAL	LABOR MAN DAYS	LABOR UNIT COST	LABOR LABOR TOTAL	OTHER OR EQUIP RENT	FREIGHT	TOTAL
	Estimated Project Duration	90	DAYS								
	Foreman/Operator	1	EA								
	Truck Driver	1	EA								
	Carpenters/Welders	2	EA								
	Local Labor	4	EA								
	Labor - not included in building construction (based on 60 hours per week)										**56,000**
1	Project Manager		MD's			7	800	5,600			5,600
2	Foreman/Operator		MD's			14	700	9,800			9,800
3	Carpenters/Welders		MD's			14	700	9,800			9,800
4	Local Labor		MD's			56	550	30,800			30,800
	Miscellaneous										**282,990**
5	Mob/DeMob	1	SUM	20,000	20,000						20,000
6	Crew Per Diem	270	MD's	50	13,500						13,500
7	Crew Housing	270	MD's	50	13,500						13,500
8	Crane Rental [5]	2	MO	20,000					40,000		40,000
9	Skid Steer Rental	4	MO	3,925					15,700	4,710	20,410
10	Welder Rental	4	MO	4,000					16,000	4,800	20,800
11	Dump Truck Rental	2	MO	5,000					10,000	3,000	13,000
12	Pick-up Truck Rental	4	MO	1,500					6,000	1,800	7,800
13	Excavator Rental	2	MO	3,875					7,750	2,325	10,075
14	Loader Rental	4	MO	12,000					48,000	14,400	62,400
15	Compactor Rental	2	MO	3,675					7,350	2,205	9,555
16	Fuel	1	LS	8,000	8,000				8,000	2,400	18,400
17	Tool Rental	4	MO	4,000					16,000	4,800	20,800
18	Consumables	1	LS	5,000	5,000				5,000	2,750	12,750
	Foundation Construction										**322,232**
19	Gravel Fill [1]	420	CY	0.00	0	25.00		10,500			10,500
20	Piles [2]	26	EA	5,000	130,000						130,000
21	W12x35x12' [2]	3,780	LBS	1.30	4,914	1.20		4,536			9,450
22	W12x35x18' [2]	6,300	LBS	1.30	8,190	1.20		7,560			15,750
23	W12x35x4' [2]	280	LBS	1.30	364	1.20		336			700
24	W8x35x4' [2]	420	LBS	1.30	546	1.20		504			1,050
25	W10x12x12' [2]	6,336	LBS	1.30	8,237	1.20		7,603			15,840
26	W8x35x20' [2]	2,100	LBS	1.30	2,730	1.20		2,520			5,250
27	W8x35x2.67' [2]	280	LBS	1.30	364	1.20		336			700
28	C12x10.6x20' [2]	424	LBS	1.30	551	1.20		509			1,060
29	3/8" Metal Plate [2]	26,438	LBS	1.30	34,369	1.20		31,726			66,095
30	Metal Bar Grate [2]	208	SF	28.00	5,824	16.00		3,328			9,152
31	Galvanized Pipe Handrails [2]	200	LF	49.00	9,800	15.20		3,040			12,840
32	Galvanized Metal Treads [2]	10	EA	106.00	1,060	32.00		320			1,380
33	Spray-on Insulation	1	LS	25,000.00	25,000						25,000
34	Fencing & Gates	350	FT	20	7,000	20.00		7,000		3,465	17,465

BUDGET COST ESTIMATE
Kwethluk Power Plant
Pile Foundation

No.	ITEM	QTY	UNITS	MATERIAL UNIT COST	MATERIAL MATL TOTAL	LABOR MAN DAYS	LABOR UNIT COST	LABOR LABOR TOTAL	OTHER OR EQUIP RENT	FREIGHT	TOTAL
Building/Generation Equipment/Mechanical & Electrical/Etc[3]											**1,125,000**
35	Building	1	LS	100,000	100,000			100,000		55,000	255,000
36	Generators and Switchgear	1	LS	450,000	450,000			30,000		14,000	494,000
37	Mech. & Elec. Systems	1	LS	200,000	200,000			100,000		16,000	316,000
38	Lodging/Fuel/Training-Etc.	1	LS	30,000	30,000			30,000			60,000
Waste Heat Recovery											**370,000**
39	Power Plant Connection	1	LS	50,000	50,000						50,000
40	School Connection	1	LS	70,000	70,000						70,000
41	Pipeline	2,400	FT	50	120,000	50		120,000		10,000	250,000
System Connections[4]											**25,000**
42	Village system connection	1	LS	25,000	25,000						25,000
Upgrades to Distribution System[4]											**187,000**
43	Distribution system upgrades	1	LS	187,000	187,000						187,000
				Subtotals	1,530,949			515,818	179,800	141,655	2,368,222
										Contingency @ 10%	236,822
										Overhead @ 15%	355,233
										Profit @ 10%	236,822
										Construction Total:	**3,197,100**

[1] Gravel fill is to be donated by the community at no cost to the project
[2] Material cost includes freight.
[3] Per estimate provided by AE&E
[4] Per estimate provided by Errico Electrical Engineering. Includes materials, freight, and labor.
[5] Crane freight cost included in pile unit cost

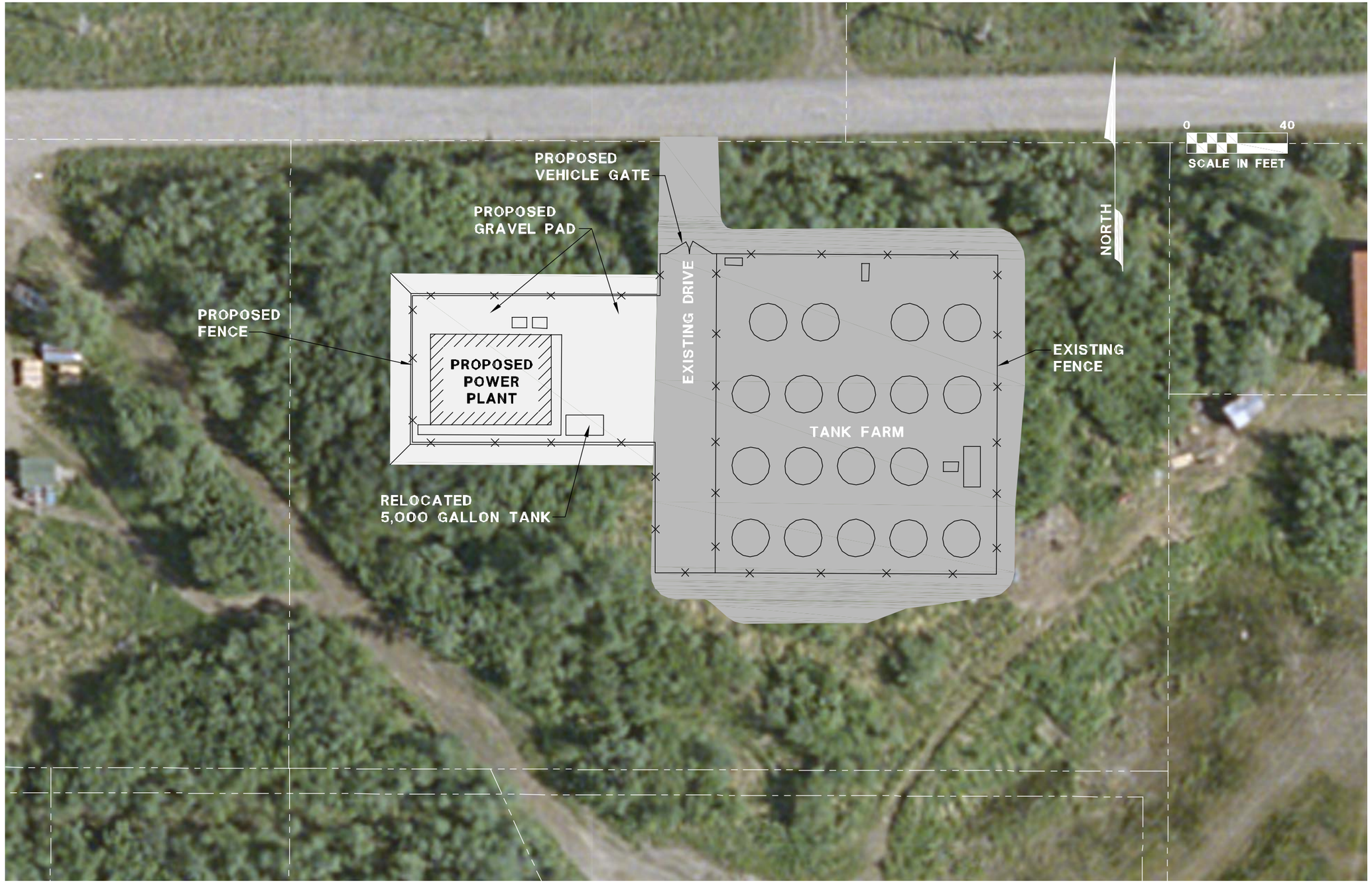
MISCELLANEOUS COSTS

43	Project Insurance	20,000
44	Site Control Legal Work	15,000
45	Engineering Allowance	110,000
46	Construction Management Allowance	100,000
47	Grant Audit	4,000
48	Fire Marshall Review Fee	7,700
	Misc. Cost Total =	**256,700**

APPENDIX J

CONCEPTUAL DESIGN DRAWINGS

PHOTOGRAPHY BY AEROMAP, U.S.
DATE OF PHOTOGRAPHY: JUNE 24, 2000



SITE PLAN

SCALE: 1" = 40'

ALASKA ENERGY AUTHORITY

RURAL POWER SYSTEM UPGRADE
KWETHLUK, ALASKA

LCMF LLC
615 E. 82nd Ave. Suite 200 Anchorage, AK 99518 272-1830

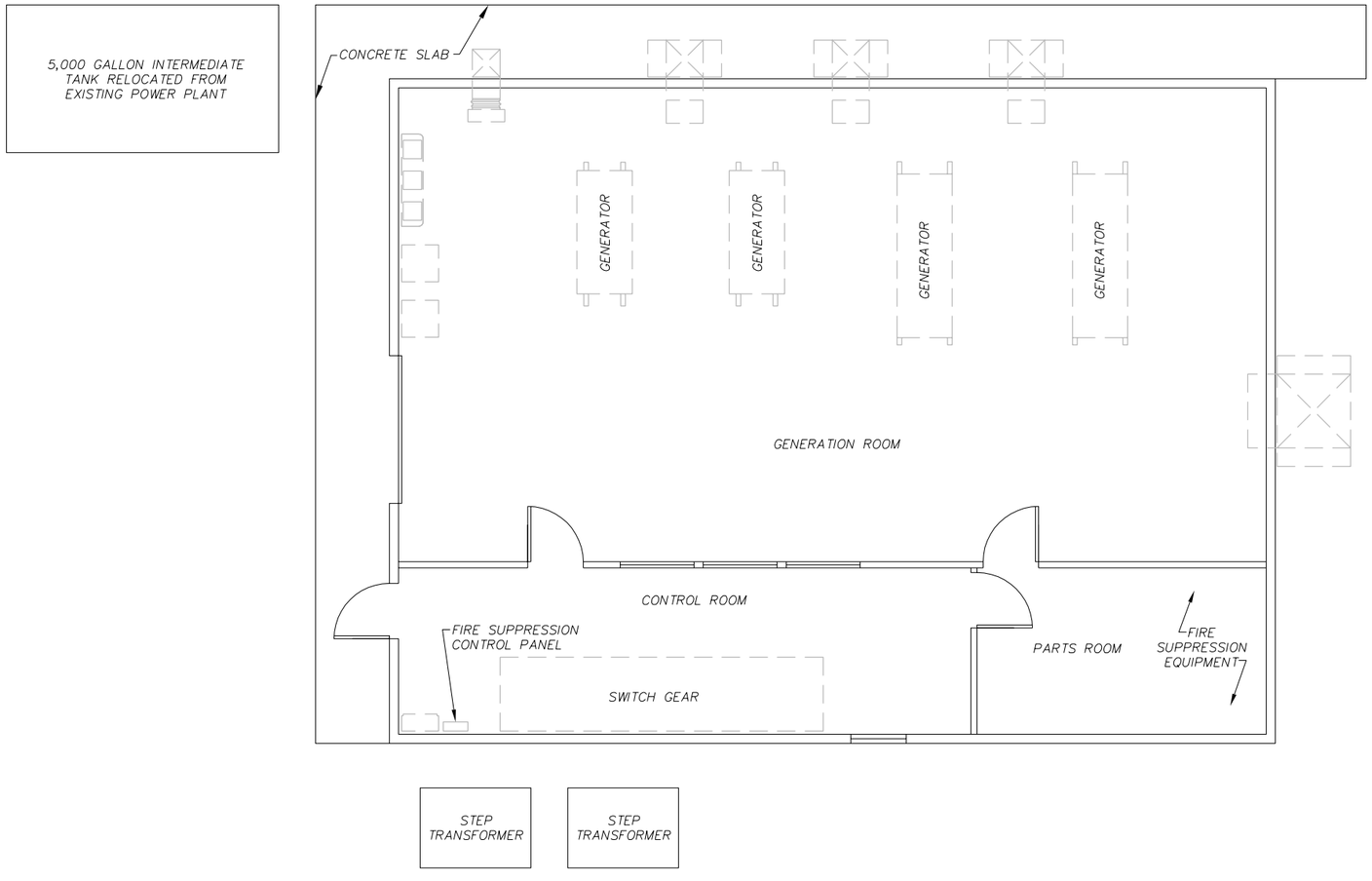
CONCEPTUAL DESIGN

REVISIONS:

DRAWN BY: DAR & SLF
CHECKED BY:
DATE: 04/03/07
JOB NUMBER: 06-764
SCALE: AS SHOWN

DRAWING TITLE:
SITE PLAN

SHEET: OF
C-1



FLOOR PLAN

SCALE: 1/8" = 1'-0"

ALASKA ENERGY AUTHORITY

RURAL POWER SYSTEM UPGRADE
KWETHLUK, ALASKA

LCMF LLC
615 E. 82nd Ave. Suite 200 Anchorage, Ak. 99518 (907) 273-1830

CONCEPTUAL DESIGN

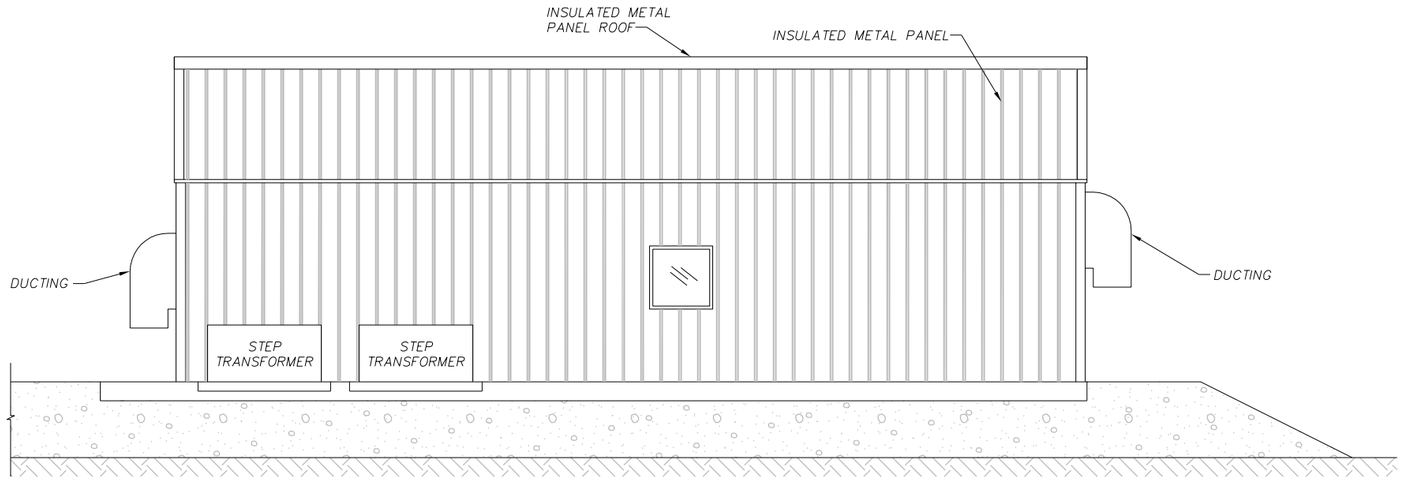
REVISIONS:

DRAWN BY: DAR & SLF
CHECKED BY:
DATE: 04/03/07
JOB NUMBER: 06-764
SCALE: AS SHOWN

DRAWING TITLE:
FLOOR PLAN

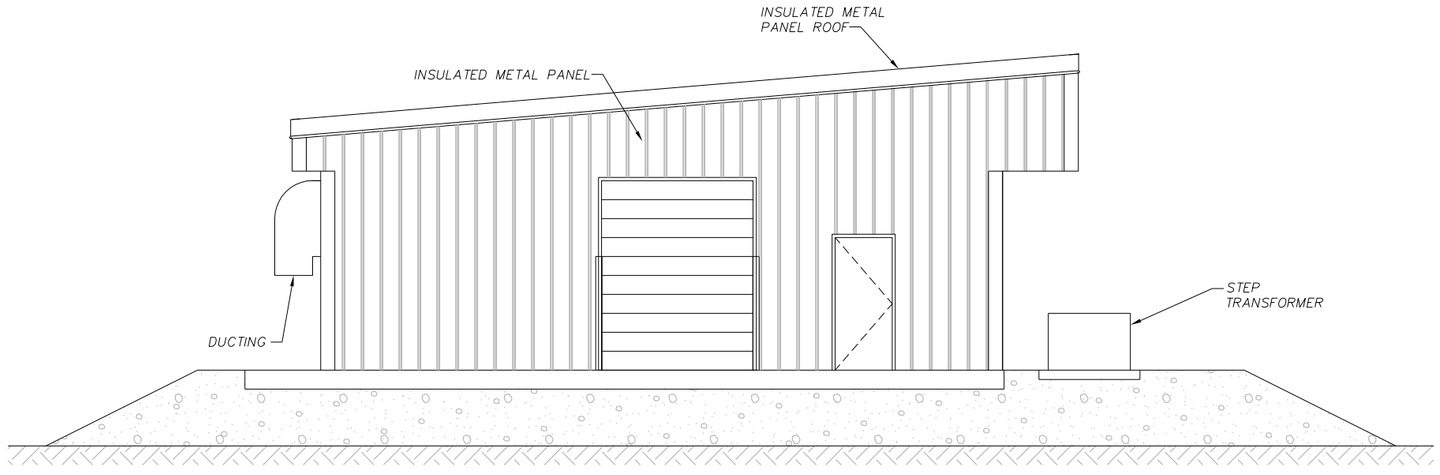
SHEET: OF
A-1

PLOTTING DATE: 8/8/07 (09:59) BY: zgall
AUTOCAD DRAWING NAME: Floor Plan.dwg



FRONT ELEVATION

SCALE: 1/8" = 1'-0"



SIDE ELEVATION

SCALE: 1/8" = 1'-0"

ALASKA ENERGY AUTHORITY

RURAL POWER SYSTEM UPGRADE
KWETHLUK, ALASKA

LCMF LLC
615 E. 82nd Ave. Suite 200 Anchorage, Ak. 99518 (907) 273-1830

CONCEPTUAL DESIGN

REVISIONS:

DRAWN BY: SLF
CHECKED BY:
DATE: 04/03/07
JOB NUMBER: 06-764
SCALE: AS SHOWN

DRAWING TITLE:
EXTERIOR
ELEVATIONS

SHEET: OF
A-2

PLOTTING DATE: 8/8/07 (09:58) BY: zgall
AUTOCAD DRAWING NAME: Exterior Elevations.dwg